Mining CONGRESS JOURNAL

AUGUST 1949

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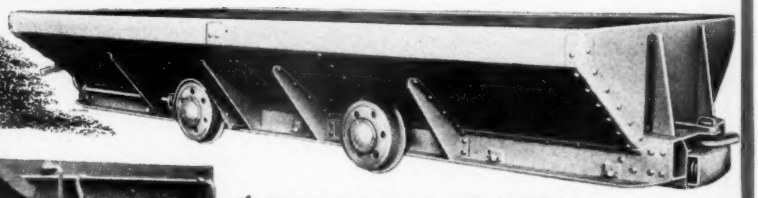

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

Indexed regularly by Engineering Index, Inc.

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THE AMERICAN MINING CONGRESS
1102 RING BLDG., WASHINGTON 6, D. C.

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Published Monthly. **Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign, $5.00. Single copies, $0.30. February Annual Review Issue, $1.00. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.**

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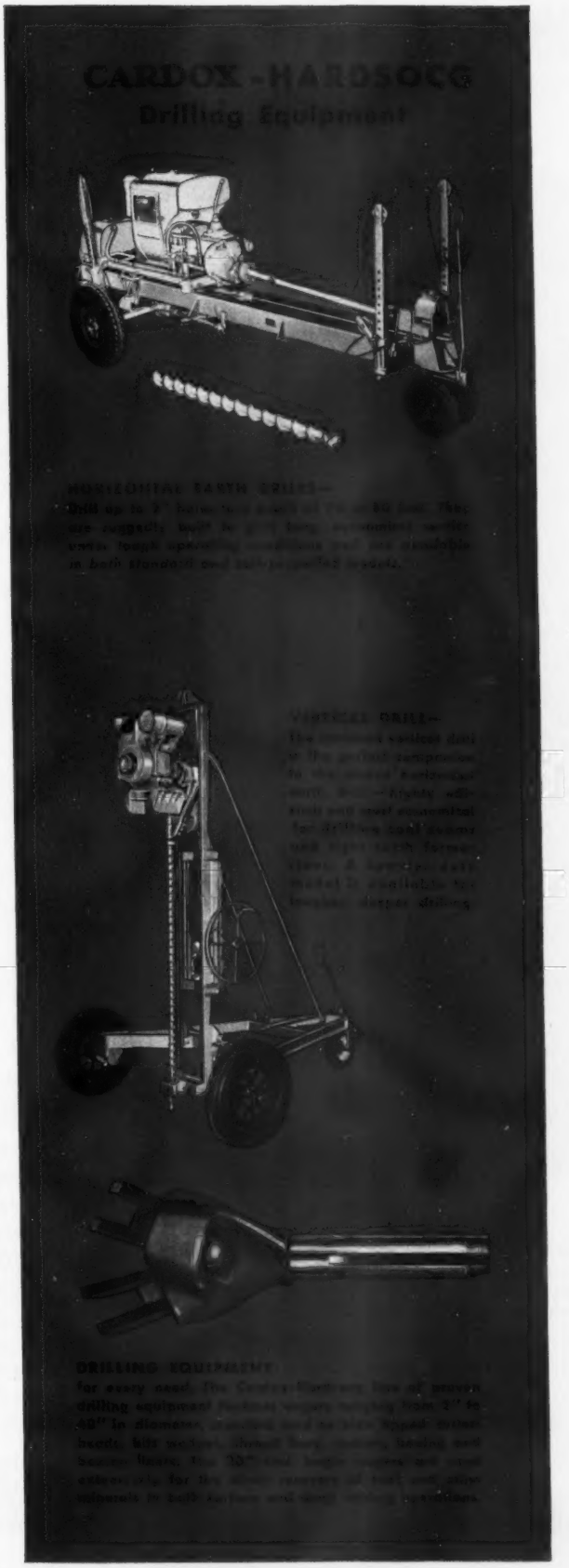

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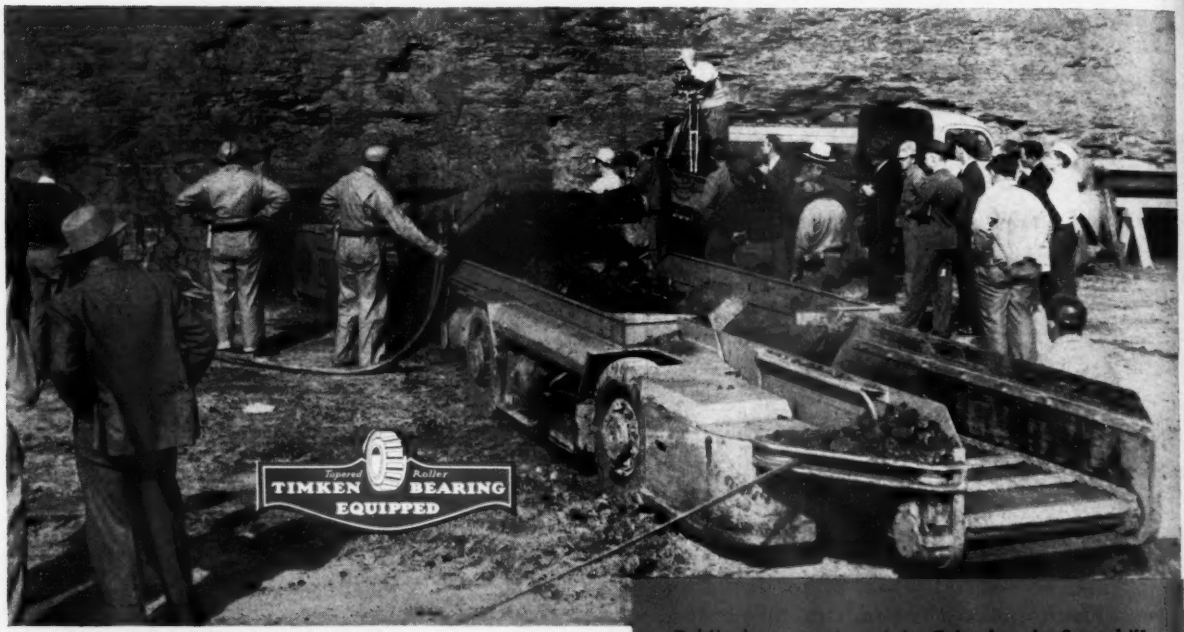

PHOTOGRAPH COURTESY SUNNYHILL COAL COMPANY.

Public demonstration of the Colmol at the Sunnyhill Coal Company's strip mine, New Lexington, Ohio.

Like its namesake of the animal kingdom, the Colmol burrows for a living! It is literally a coal mole!

This sensational machine already has aroused nation-wide interest and has received wide publicity because it represents a revolutionary development in coal production. In recent field tests it produced more coal in less time than ever had been done before. The operator estimates that the Colmol will be able to mine and load 500 to 1,000 tons of coal a day in regular production.

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1-5/8-inch rope

	No. of Ropes	Average Cu. Yds. handled per rope
Tiger Brand	16	529,605
Brand A	4	486,614
Brand B	12	401,722
Brand C	4	436,353
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"This is not just an isolated case. Time after time where direct comparisons have been made of wire rope service life, Tiger Brand stands at the top of the list."

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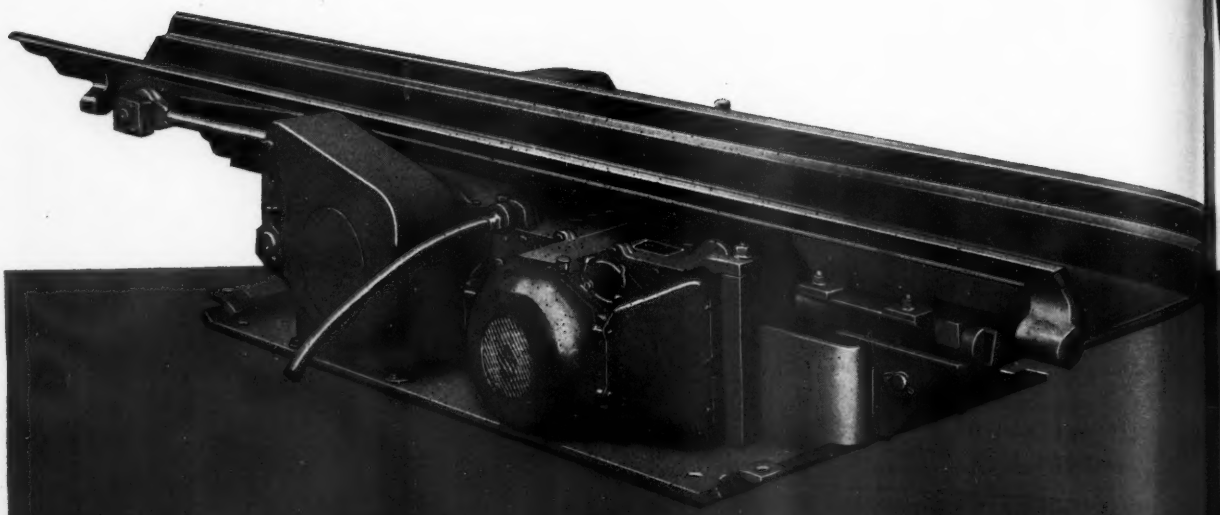

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SHAKER CONVEYORS

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THE COLUMN TYPE TROUGH . . . saves many hours in assembly or dismantling, provides greater strength for longer wear, gives smooth operation to longer conveyor lines.

COLUMN TYPE SHAKER TROUGHS

Troughs are straight from end to end with flush type joint. Timber trucks move easily either way. Flexible for use on uneven bottom without damage to trough or clamp.

Trough section can be renewed.

Straps formed to contour of trough and welded to side angles.

Side angles provide strength, reduce stretch and whip, eliminate cracking or splitting at the ends of trough.

Trough clamp can be installed in 15 seconds. Stays tight. No bolts to break.

Steel end casting carries dowel pins for insertion into lugs on guide frames and into sockets on adjoining trough.

A Goodman sales engineer will give you complete details

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Bit Changing Reduced to 1/284

AT CLYMER NO. 2, CLEARFIELD BITUMINOUS COAL CORP.

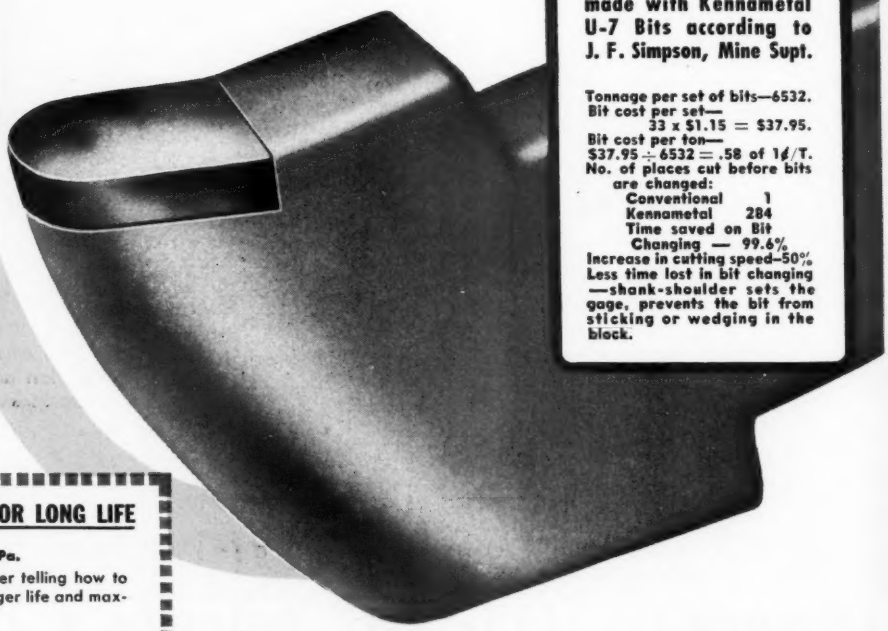
J. F. Simpson, superintendent, says, "We have used Kennametal Bits for three years and they have saved us 284 bit changes per set. We like that because this seam formerly required either a complete new set of bits or a complete setting of bits every cut. Kennametal cuts 284 places before they are changed. That's good enough to convince us that there's no better bit for cutting coal."

Because cutting conditions are severe and because mine officials are among the most progressive in the business (they have never been stopped because of unsafe mining conditions in their 13-year history) they were among the first to equip with Kennametal. Today they say, "We will never use anything else."

The summary below shows how much more cutting time there is available per shift, how production can be increased, and how cutting can be done more efficiently. Be sure to consider possible savings, production increases like these before you buy, try, or specify any other bit. Mining Division, Kennametal Inc., Latrobe, Pa.

TOP CUTTING

Goodman 712 top cutter equipped with 33 U-7's cuts 284 places 25 feet wide before bits are replaced.



Summary of Savings made with Kennametal U-7 Bits according to J. F. Simpson, Mine Supt.

Tonnage per set of bits—6532.
Bit cost per set—
33 x $1.15 = $37.95.
Bit cost per ton—
$37.95 ÷ 6532 = .58 of 1¢/T.
No. of places cut before bits are changed:
Conventional 1
Kennametal 284
Time saved on Bit Changing — 99.6%
Increase in cutting speed—50%
Less time lost in bit changing —shank-shoulder sets the gage, prevents the bit from sticking or wedging in the block.

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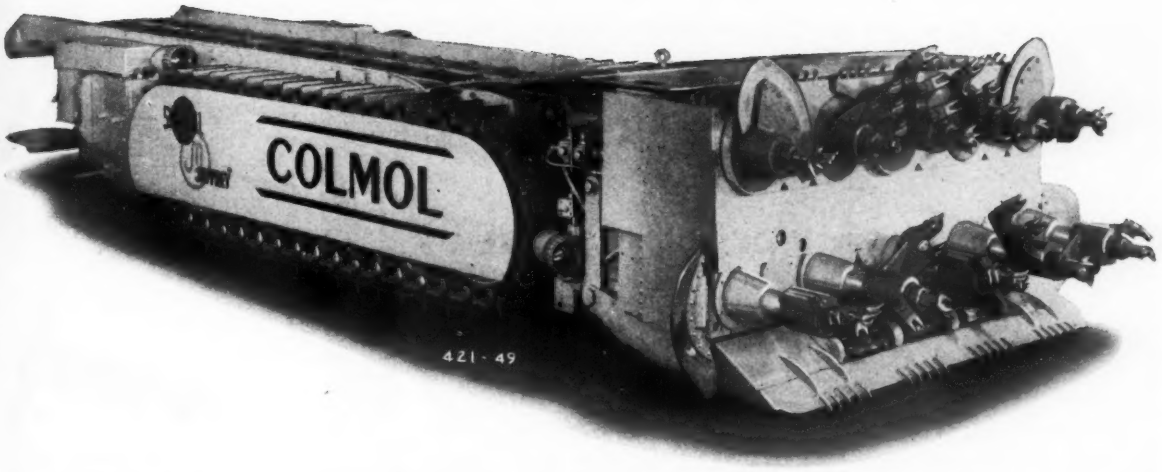

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Advances the face in one operation—moves forward under its own tractive power. Permits mining with reasonable safety under roof conditions unsafe with conventional methods.

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Produces a run-of-mine coal with a minimum of fines—greatly reduced dust hazard.

Leaves floor clean and uniform—less than 1% of coal left in outer corners of the room.

Passes within ¼ inch of a vertical post or timber repeatedly without hitting it—control is accurate.

Stands the gaff—a 20 or 30-ton roof fall will cause no damage—fallen material is removed by the machine.

Operates with little or no vibration—requires less timbering.

Reduces the hazard to operator—he is located near the rear of the unit approximately 20 feet from the face.

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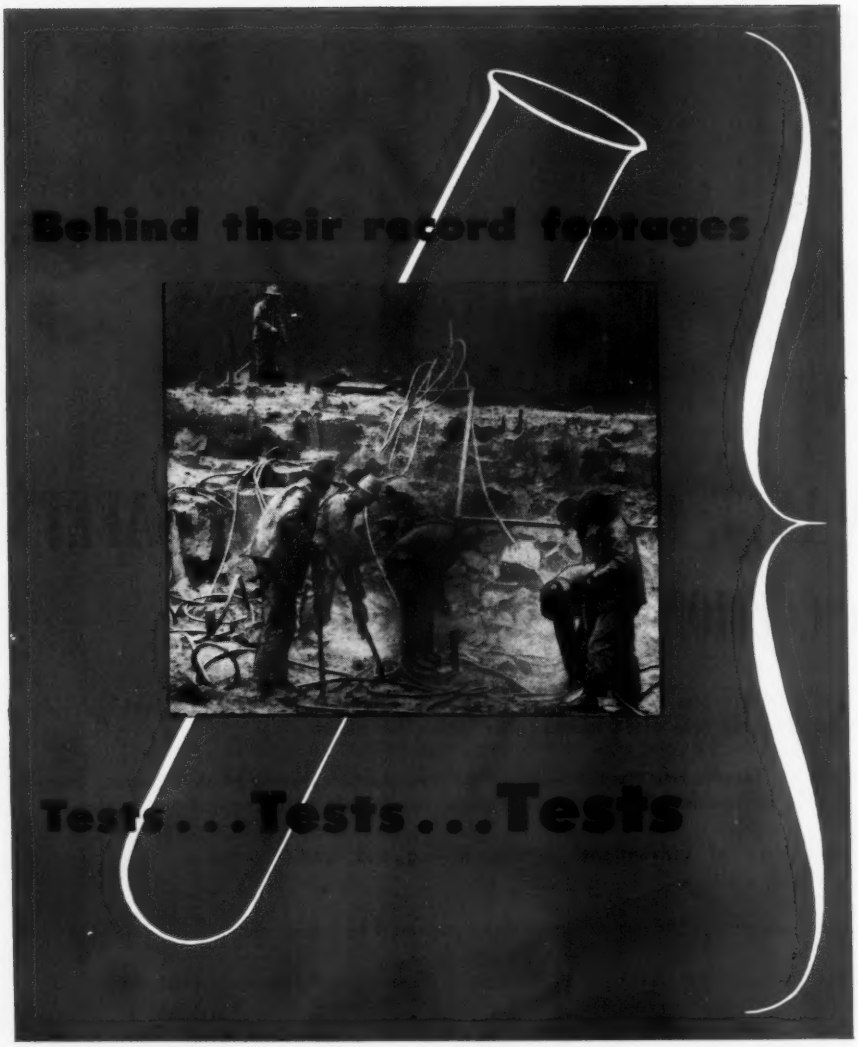
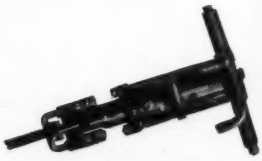


Gardner-Denver S33 — known as the most powerful 31-pound drill in its class.



Gardner-Denver S45 — a champion in soft and medium formations.

Gardner-Denver S55 — the most popular 55-pound sinker on the market.

Gardner-Denver S73 — 67 pounds of speed and power for the deeper holes, the hardest rock.

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INTERNATIONAL HARVESTER COMPANY
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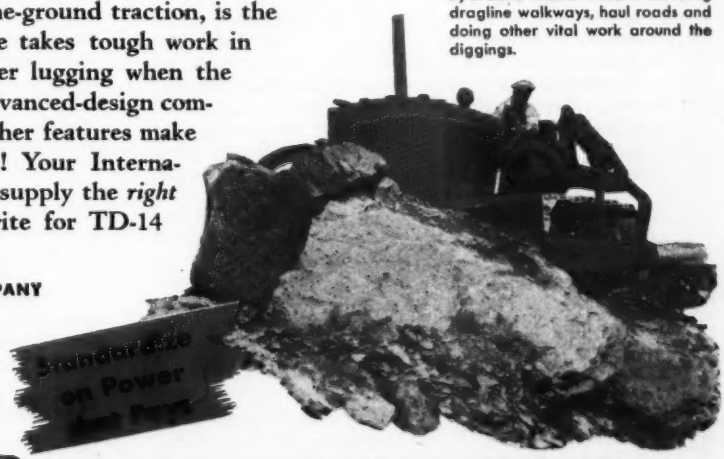
Hear James Melton and "Harvest of Stars" every Sunday—NBC

An International TD-14 Diesel puts these rocks in their place with its hydraulic blade before building dragline walkways, haul roads and doing other vital work around the diggings.



CRAWLER TRACTORS
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POWER UNITS

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wherever coal is prepared . . . there is

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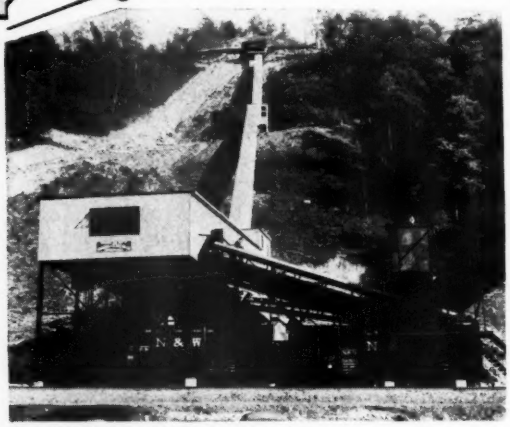

Feds Creek Coal Co., Biggs, Kentucky

YOU FIND THE WORDS, *Engineered by RandS*, in use wherever coal is prepared, in every major coal producing area of the country. And, invariably, the preparation plants to which those words apply are the acme of functional design and operating efficiency. These plants do the job they were intended to do . . . dependably . . . to their owners' satisfaction and profit. That's why "Engineered by *Rand*S" has become the traditional sign of successful coal preparation plants.

Typical of *Rand*S-Engineered plants around the country are the two Eastern Kentucky plants pictured here. Into their design went consideration of all important factors: nature of the raw coal, desired end products, characteristics of plant site, and available shipping facilities. Into their construction went the best possible workmanship and materials . . . and the 40-year-old Roberts and Schaefer Company tradition of *doing things right*.

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Mining CONGRESS JOURNAL

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
SHELDON P. WIMPFEN, *Editor*

VOLUME 35 AUGUST, 1949 NUMBER 8

Advancing Safety—With Caution

EXTENSIVE research, study, and experimentation are forwarding the wide acceptance of roof bolting as a means of roof control. As long ago as 1916 this method was applied in the Breeze mine of the Old Ben Coal Corp. Since then the St. Joseph Lead Co., the Empire Zinc Division of the New Jersey Zinc Co., Consolidated Coal Co., Tennessee Coal, Iron and Railroad Co., Bethlehem Collieries Corp., and many other companies have successfully used this system. However, lack of an adequate understanding of the principles involved has delayed the widespread adoption of this unique method of roof support.

At this time more than 160 mines are using trial installations and a number have adopted the method for systematized use. In coal mines alone there are some 37 linear miles of roof supported by bolts, and no lost-time, roof-fall accidents have occurred in these areas. Extensive applications are in use in metal mines and a number are conducting trials that have promise of greatly reducing support costs. Establishment of the new Roof Control Section of the Bureau of Mines, which undertakes all problems connected with roof control, gives recognition to the importance of roof bolting to all underground mining operations.

Many operating advantages are gained by employing this novel method; a systematic method of support; improved ventilation; increased clearance; safer operating conditions and reduced cost of support. Since the width of advancing faces may be increased, roof bolting presents a means of obtaining higher extraction on first mining. Operating efficiency may be improved and extraction accelerated.

These many advantages have been sufficiently attractive to increase greatly the interest in roof bolting. Although most operators are employing well-warranted caution in trial installations, some are reported to be rushing to adopt the method without benefit of an adequate study of their specific roof conditions. Much remains to be learned about roof bolting. Each mine presents an individual problem that must be solved before roof bolts may be applied successfully. No panacea to the problem of roof control, roof bolting should be employed judiciously, on a trial basis, before application at working faces.

Paralleling the growth of interest in roof bolting have come a wide variety of bolts offered by different mine supply houses. Only a competent study of local conditions can resolve the questions of which type of bolt to use, the size of the bolt, hole dimension and angle, spacing, and whether washers alone or channel irons are needed in the installation. Although the Bureau of Mines advocates the extension of the use of this type of support, no permissibility schedule for types of bolts and their efficiency has been set up nor is one contemplated.

Roof bolts have failed in some instances; tension has stripped threads, pulled rods apart, and torn bolts loose from anchorages. Some of these failures have been conducted under test conditions in attempts to gain more knowledge of the method.

No exact formula has been developed that may be applied to determine the best method to use. The cut-and-try system, with caution and close study, appears today to be the only means of establishing the preferred system to use under a given set of conditions.

If you are considering using roof bolting, arm yourself with the best available knowledge on the practice. Conduct controlled tests in areas where a roof fall would not endanger mine crews nor operations. By this approach, your operations may be able to take successful advantage of the many benefits of roof bolting.

Perpetual Crisis

IMPOSITION of the strike every Thursday in the coal producing industry has been accomplished by the ruthless monopolistic force of the UMWA. Obviously designed to better the union's bargaining position by reducing coal stocks to a critical minimum, the three-day mine week is simply a strike which works to the detriment of the coal-consuming public, the coal miners, and the operators.

Estimates of increased costs of production range from 25 cents to $1 a ton. This increment in production cost stems from the fact that fixed costs such as taxes, royalties, interest, depreciation, and rentals must be charged against the reduced tonnage produced; higher unit costs and higher unit prices result.

Lowered annual earnings will be the lot of some 400,000 coal miners. Not only will their reduced purchasing power affect economic conditions in the coal fields, but the reduced tonnage to be moved will cause an economic loss to railroads and railroad workers.

The intermittent operation of the mines increases hazards, and has already caused mines to be abandoned and pillar coal lost. Business has been lost to competing fuels. Through the union action, amounting to confiscation of a large part of the capital invested in coal producing facilities, operators have lost control over costs.

Currently, the Senate Committee on Banking and Currency is conducting hearings to determine the extent and trend of the economic power of the unions. Many representatives of the coal industry have testified on the adverse effects of union monopoly. Among them was Harry M. Moses, president, H. C. Frick Coke Co., who pointed out the absolute power of the UMWA by stating "The wage agreements which have been brought about in the coal industry during and since the recent war were not negotiated agreements. They were the result of ultimatums that were enforced under manufactured crises by the force of the economic power wielded by the union."

Now another crisis is in the making. The legal hypocrisy that provides immunity to labor leaders for acts which, if taken by industry, would result in severe penalties, tends to destroy freedom and promote socialism. That Congress is investigating the matter is encouraging. Action to protect the public interest by placing labor leaders on an equal basis with all other classes of citizens is overdue.

This difficult condition was corrected with roof bolts and "shin plasters"

Suspension Roof Supports*

Part I—Progress Report Shows Wide Acceptance of Bolting as Means of Reducing Roof Falls

By EDWARD M. THOMAS, A. J. BARRY and ARTHUR METCALFE,

Engineer in Charge and Mining Engineers, Roof Control Section, U. S. Bureau of Mines

EARLY in 1947 the Bureau of Mines became interested in adapting suspension roof support to coal mining as a possible means of reducing the high rate of accidents from falls of roof. For a time the program made little progress because of the shortage of steel products after the end of World War II, but during the past eight months this restriction has eased, and as of May 1, 1949, 114 mines had either started experimental work or had ordered materials and equipment in anticipation of trial installations. It is estimated that 30 linear miles of roof in underground passageways have been secured by this method in recent months and no lost-time roof-fall accident has been reported in these areas up to that date.

Many coal-mining companies in widely separated localities have cooperated in making experimental installations. In very few instances are these companies entirely satisfied that they have arrived at the best solution in determining the most efficient adaptation to suit their particular conditions. Moreover, new ideas and modifications of the basic principle are constantly being brought to light and are being tested. Available test data is far from complete, and it is conceivable that some new idea will be developed to alter the present concept of proper technique; therefore, this progress report does not attempt to answer all questions that might arise in connection with this method of roof support; it simply recounts the experience acquired to date. Consequently, few references to costs are made. Up-to-date quotations on material and equipment used in suspension roof-support installations may be obtained from numerous mine-supply companies.

The authors gratefully acknowledge the cooperation of mining companies whose personnel made possible collection of the information contained in this circular; Bethlehem Collieries Corp., Barrackville, W. Va.; Berwind - White Coal Mining Co., Windber, Pa.; Consolidation Coal Co. (Ky.), Jenkins, Ky.; Consolidation Coal Co. (W. Va.), Fairmont, W. Va.; Clinchfield Coal Corp., Dante, Va.;

* This report will be published by the U. S. Bureau of Mines as Information Circular 7533.

Consolidated Coal Co., St. Louis, Mo.; Hanna Coal Co., St. Clairsville, Ohio; Missouri Portland Cement Co., Sugar Creek, Mo.; Pocahontas Fuel Corp., Pocahontas, Va.; Reppert Coal Co., Dola, W. Va.; St. Joseph Lead Co., Bonne Terre, Mo., and Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

The fundamental theory of suspension roof supports is not new; in fact, its application in the construction of beams predates mining itself. The basic principle involved is the reinforcement of roof rock with steel rods inserted in the roof and anchored therein at points where the rock is least likely to be affected by stresses resulting from mining. Such roof supports have been used in mines for many years in widely separated localities. The St. Joseph Lead Co., operating in southeastern Missouri, apparently was the first large mining company to prove the practicability of the principle by applying it in a systematic manner for securing roof for more than 20 years.

Possibly the reason for the delay in acceptance by the "practical miner" was that the method appears at first glance to approximate "holding one's self up by one's bootstraps." In fact, in attempting to find a suitable descriptive name for this method of roof reinforcement, in which the roof apparently supports itself instead of being supported by conventional timbering many persons suggested "sky hooks." Nevertheless, the principle is scientifically sound. Briefly, it involves a method of applying reinforcing material to provide additional beam strength. Roof rocks have planes of weakness owing to thin bedding, cleating, or faulting, which during mining may be bound together to form competent beams across openings.

Justification for Roof Bolting

Depending on previous mining practices at a particular mine, an immediate increase in material cost may occur upon conversion from conventional timbering to the suspension support method. For this reason, mine operators should be cautioned not to adopt makeshift and potentially unsafe variations of suspension supports without proper preliminary experimental preparation. To justify the greater material cost, some advantages that may be gained if this type of support is installed properly are listed below and all reflect directly or indirectly on the final cost of operation.

With regard to safety, the companies that have experimented with large installations, especially in fully mechanized mines, report the following advantages:

(1) A systematic method of support is provided at the working face. In fact, to obtain maximum benefit from the method it is necessary to install the supports within a few inches of the face before cutting the coal, so that flexing of the immediate roof strata is held to the minimum. When this is done, the mining-machine operator, driller, shot firer, and loading-machine operator have adequate protection without using safety posts, which are easily dislodged. Moreover, when the immediate roof is supported rigidly, experience has shown that it is less likely to shatter during blasting.

(2) This type of support cannot be dislodged by blasting or moving equipment. A preliminary breakdown of roof-fall accident statistics obtained from the Accident Analysis Branch, Bureau of Mines, shows that, in 1946, 14 fatal and 138 nonfatal accidents were attributed directly to the unintentional dislodgment of roof supports.

(3) Ventilation is benefited because resistance to the flow of air through mine passageways is reduced. At a certain gassy mine it is necessary to extend line brattice to the face. After conventional timbering was supplanted by suspension roof supports, removal of obstruction behind the brattice increased the volume of air that sweeps the face an average of 15 percent.

(4) Cuts of coal are "cleaned up" thoroughly so that only small amounts remain along roadways to be ground into explosive dust. Thus, indirectly

Roof bolting and channel iron installation at St. Joseph Lead Co., Bonne Terre, Mo.

Water and air lines are readily suspended from roof bolts

explosion hazards are reduced through the use of suspension supports.

(5) Side clearance along roadways is improved by the elimination of timbers; moreover, storing of bulky timber, which often obstructs clearance along roadways, is eliminated. In addition, overhead clearance is improved through absence of crossbars. The 1946 record of causes of accidents in coal mines shows 32 fatal and 1689 nonfatal haulage accidents to persons who were squeezed between moving equipment and cars, ribs, timbers, or roof.

(6) Housekeeping in general is improved; storage space for materials is reduced; electric power cables, trailing cables, water and air lines and brattice cloth are supported with specially designed brackets, which are attached to the suspension-bolt ends.

From the standpoint of efficiency, the suspension roof support affords several distinct advantages:

(1) A loading machine can clean up a cut from rib to rib without interference of timber legs. Under most mining conditions if a cut is shot properly a shoveler or pick man is not required to "clean up" at the face during the loading cycle. Such a pick man ordinarily trims the ribs and face, protected by temporary screw jacks, after the loading machine has completed its work and before the roof-bolting crew enters. Although available time-study data are few, it is evident that 15-50 percent of the time required to load a cut when the roof is supported by conventional legs and crossbars is saved when loading under roof bolts. One company reports, "Approximately 12 minutes per fall (cut) of coal is saved in loading time by elimination of face timbers and not having to advance crossbars during the loading cycle." Formerly, conventional crossbar sets on 4-ft centers were used at this mine and it was necessary to stop loading of coal to erect them. At present, the mine has roof bolts consisting of vertical rods 1 in. in diameter, 54 in. long, and with 8 by 8 by ⅝-in. bearing plates on 4-ft centers.

(2) A few experiments indicate that in some instances mine openings, especially rooms, can be widened considerably with safety by installing roof bolts, thus reducing drilling and explosives costs and increasing the efficiency of loading machines through reduction of tramming time per ton loaded.

(3) Mobile equipment, especially shuttle cars, can be moved faster with greater safety.

(4) Usually, the labor cost of installing this type of support will be less than for conventional supports, especially when roof bolts replace conventional wooden crossbars.

(5) Ordinarily, suspension supports may be considered permanent. The experience at mines of the St. Joseph Lead Co. and at other operations is

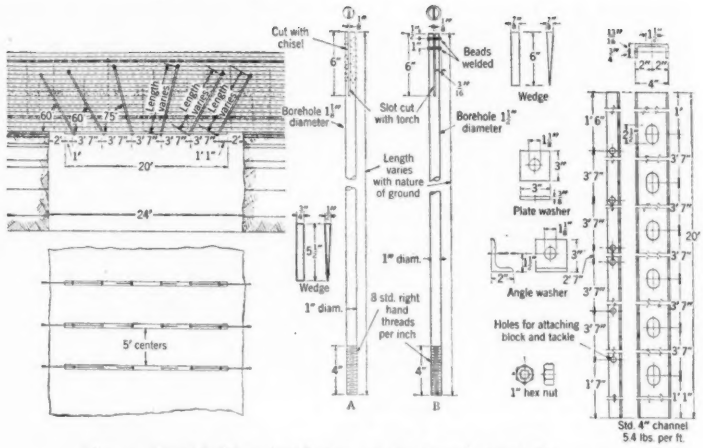


Fig. 1. Roof bolting installation at St. Joseph Lead Co.

that supports installed at the face immediately after the roof is exposed rarely require further attention.

(6) Roof-support materials are much less bulky than conventional timbering materials; thus, substantial savings accrue through lessened demands on the transportation system.

Variations in Use

Although the principle of suspension roof support is basic, each mine should be considered an individual problem when the use of such support is contemplated. Very little investigative work has been done to determine the physical properties of rocks in place, especially the thinly bedded shales and sandstones associated with minable coal beds. In view of the scarcity of physical test data available, it is not now possible to present formulae that can be applied to determine accurately the best anchoring device, the most effective angles at which to install rods, or even the best diameters of drill holes and rods.

The details of present installations have been determined largely by "cut and try" methods based on the appearance of the roof rocks, the difficulties encountered when conventional supports were used, and tools available. Probably future installations will be determined similarly for some time to come. Admittedly, the factor of safety has been as great as could be provided, possibly greater in some installations than is necessary for systematic work. In every Bureau-sponsored installation every precaution has been taken to insure against failure that might cause personal injury.

Many mine-equipment manufacturers realize that there is a potential market for suspension roof supports and have designed or are designing new equipment to facilitate installation.

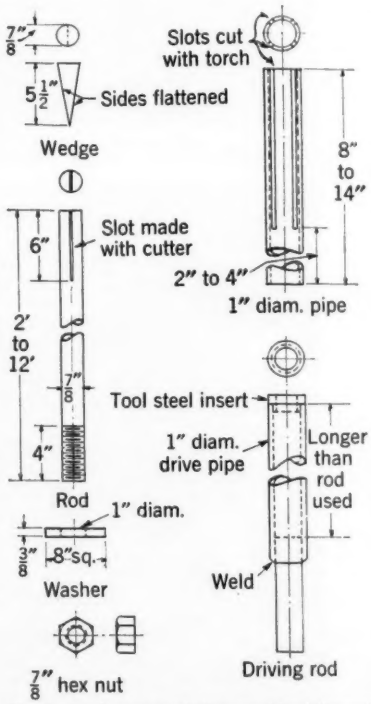


Fig. 2. Anchorage variation used by Missouri Portland Cement Co.

St. Joseph Lead Co. Practice

The experimental work done thus far in other fields has not justified any basic changes in the practice developed by the St. Joseph Lead Co. Standard practice for many years has been to install 1-in. rods averaging 8 ft in length at an angle on about 4-ft centers along a 4-in. channel bearing plate bent to conform with the immediate roof contours. The bedded dolomitic rock formation has numerous vertical slips that do not conform to a systematic pattern; therefore, the sets are not necessarily installed paralleled to one another but so that they cross a maximum number of

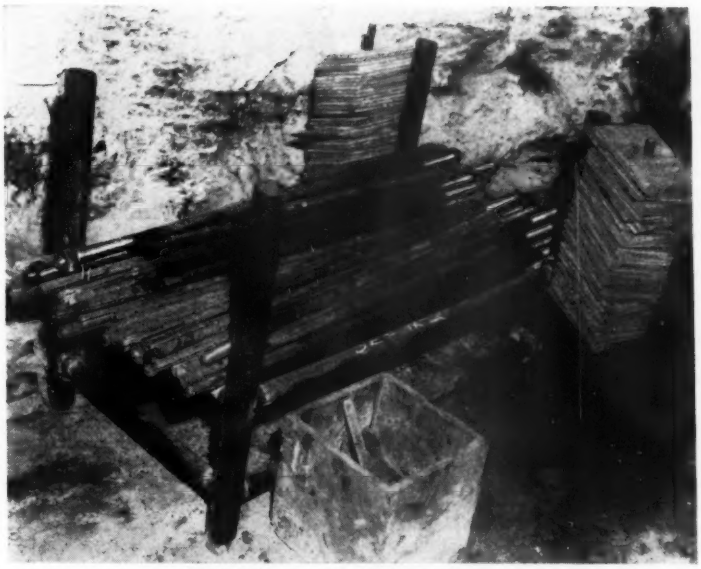
slips. Single rods fitted with square bearing plates at the mouths of holes usually are installed either at an angle or vertically to support a small area of insecure roof. This type of support is called a "shin plaster." All drilling for suspension roof supports is done with pneumatic percussion drills. Usually, because of the high back, light, hand-held pneumatic drills are used in conjunction with ratchet-type feed boards or block-and-tackle.

Ordinarily, a suspension support set comprised of a channel and several rods is erected by workmen who are supported on a scaffold or "trapeze." The procedure for erecting is as follows:

(1) The foreman determines the limits of the area to be supported. He orders 4-in. channels to be fabricated at the shop with holes spaced on about 4-ft centers along the length of the channel (Fig. 1). If the surface of the roof is uneven, the channel is bent in the shop to conform therewith and allowance is made to maintain the holes on about 4-ft centers. Any minor irregularities are ignored because the channel can be bent somewhat when the rods are tightened.

(2) Starting in firm roof (near a pillar or another support), a vertical hole is drilled about 6 in. deep and an eyebolt is secured in the hole by driving an ordinary feather-edged wedge (with a sledge hammer) between the shank of the bolt and the side of the borehole so that it can be recovered later.

(3) The pneumatic drill is attached to a small block-and-tackle, which, in turn, is supported by the eyebolt; thus, a means of support and a feed for the drill is obtained.



Roof bolt storage requires little space

(4) After the first rod hole is drilled a threaded driving dolly is attached to the threaded rod head for protection of the threads. The rod then is anchored in the hole by driving it to refusal with the pneumatic drill. One end of the channel is then fitted over the protruding end of the rod; the other end of the channel is supported by a timber jack set on the mine floor or on the trapeze. The first rod is secured to the channel with an angle washer and a nut that is tightened with a pneumatic impact wrench.

(5) Subsequent boreholes are drilled by using the holes in the channel as a template, and the rods are secured similarly to the first one, except that the block-and-tackle is attached to holes drilled in a flange of the channel.

After drilling each hole and before a rod is anchored therein, the back of the hole is "sounded" by striking it with a steel bar. If the sound is "drummy" the hole is drilled deeper until firm ground is attained and a longer rod is used.

Other Practices

As stated heretofore, the basic concept is capable of wide variation. Records disclose the use of suspension supports in coal mines in this country as early as 1905; however, because of space limitations and because the adaptations are not in use at present, no attempt is made to list them here.

In the mines of the Missouri Portland Cement Co. at Sugar Creek, Mo., a method of roof support is used that is quite similar to that of the St. Joseph Lead Co. and was developed during approximately the same period. The principal difference is in the method of anchoring in parts of the mine where soft rock is encountered and anchoring is more difficult. In such places an ingenious device is used (Fig. 2). After a rod is driven over its wedge, a steel tube 8-14 in. long and with three-fourths of its length slit by a torch into four strips is slipped over the rod and driven tightly against its wedged end of the rod by a sleeve-type driving rod, whereupon the slit tube is deformed and apparently reinforces the soft rock at the back of the holes, decreasing plastic flow.

In a series of articles in *Colliery Engineering* in 1945 and 1946, Z. S. Beyl, mining engineer of Delft, Holland, proposed a method of supporting

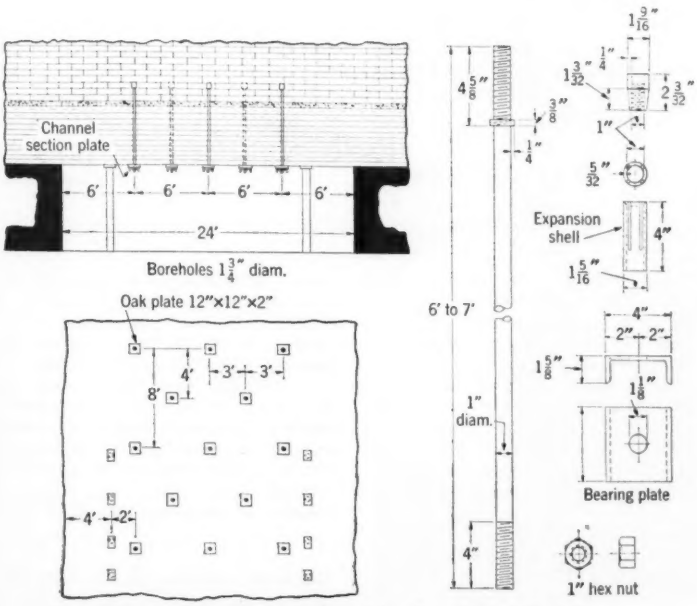


Fig. 3. Expansion hanger method used by Consolidated Coal Co.

roof in longwall mining that incorporated the use of vertical rods with expansion-bolt anchors. Beyl's method, which is patented in the United States, is based upon experiments made in British mines during the war.

The No. 7 mine of the Consolidated Coal Co., Staunton, Ill., was the first coal mine in this country in which experiments were conducted with suspension roof supports as an adjunct to conventional timbering in mechanized mining.[1] At this mine an immediate roof of thinly bedded shale is anchored to a strong main roof of heavily bedded limestone (Fig. 3). One-inch rods 18 in. longer than the thickness of the shale are anchored by means of a specially designed expansion shell. An oak bearing plate 1 ft square and 2 in. thick is secured by means of a washer (usually scrap steel channel sections sawed into 10-in. lengths) and a 1-in. hexagonal nut. These supports are supplemented with wooden posts, particularly in rooms, and sometimes with conventional crossbars. The bore holes are drilled with a standard stoper drill, the rods are anchored, and the nuts are tightened with ratchet-type hand wrenches.

A similar method is used where the immediate roof is very weak thinly-bedded shale overlain with a main roof of heavily bedded sandstone. Rods 1 in. in diameter and 54 in. long are inserted in holes 1⅜ in. in diameter and 52 in. in depth, drilled on 4-ft centers. The mine is in the development stage, and conventional timbering is not used to supplement the bolting. Prior to the adoption of suspension supports crossbars were installed on 4-ft centers.

A method essentially the same but differing in spacing of holes and length of rods is satisfactory where the roof is composed of thinly bedded but texturally strong rocks, such as sandstone, limestone, or sandy shale with no pronounced vertical cleats (Fig. 4). In other words, borderline cases, where openings, say, 12 ft wide would not require crossbars for support but failure would result when 16-ft places are driven.

In one ore mine having a strong but thinly bedded shale and sandstone roof, the roof usually broke when slusher stopes 35 ft wide were driven even though a row of stulls was maintained in the center of the stopes. When "shin plasters" 6 ft long were installed on approximately 6-ft centers, it was found that the stopes could be widened to 60 ft and yet maintain safe roof conditions. Where rods can be installed vertically, savings in drilling and material costs can be realized.

Some of the most difficult roof-support problems in coal mines in this country, including "cutter" and "snap" roof conditions have been solved by using four-angled rods with a transverse light channel section.

This method closely resembles the St. Joseph Lead Co. practice, except that the rods are installed at an angle of 45 deg. This method appears to afford a good measure of safety and at present is being used to initiate many experimental installations (Fig. 5).

From the results obtained it appears that the angled rib holes, many of them, probably, with rods installed at an angle of 55 deg or more with the horizontal, will provide beam support across openings where vertical cleats are instrumental in weakening the strata. If the immediate roof is strong, a continuous bearing plate usually is unnecessary. Where rods are installed vertically, the holes should not be drilled in longitudinal alignment, because planes of weakness may be developed in the roof strata. The channels support no appreciable vertical load and apparently are capable of resisting lateral pressure.

Part II, describing details of roof bolting practice, will be published in the September issue.

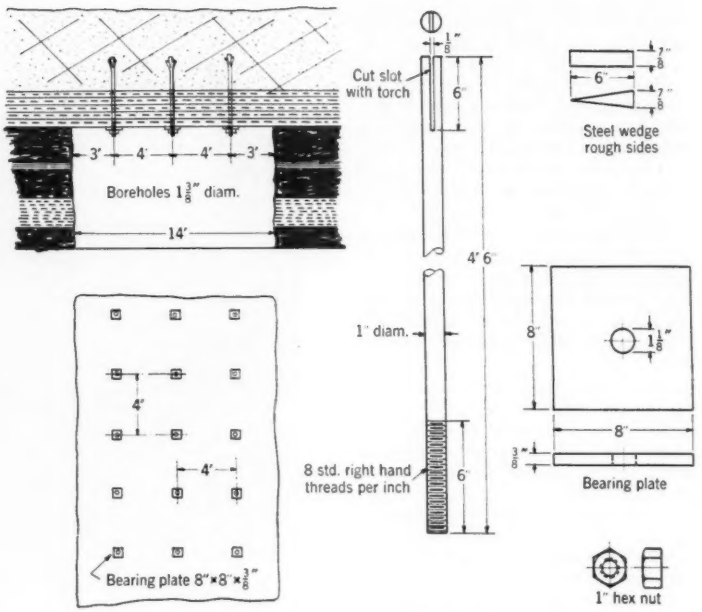


Fig. 4. A suspension support installation

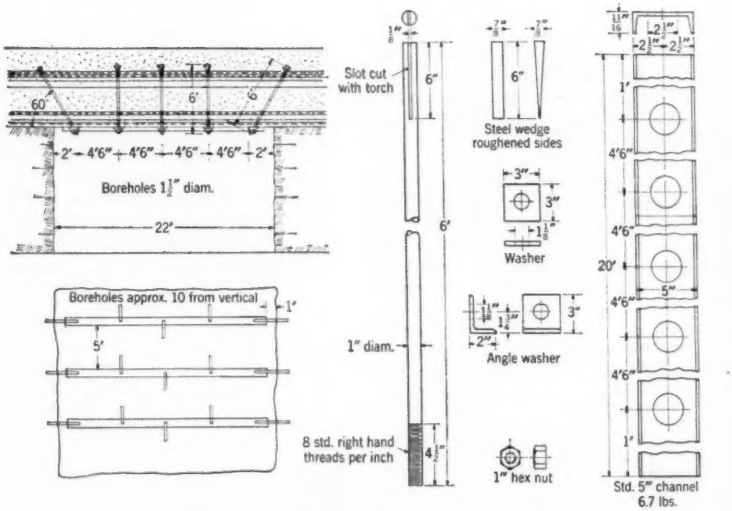


Fig. 5. A suspension support installation with some angle bolts

1 Conway, C. C., Roof Support with Suspension Rods, MINING CONGRESS JOURNAL, June 1948.

"What Are the Nation's Coal Mines Doing About Mine Safety?"

DANIEL HARRINGTON, well-known, honored and respected throughout the mining industry for his 30 years of exceptional effort in the interest of improving mine safety, was recently interviewed by Albert L. Warner, Washington radio and news commentator. They were heard June 5, 1949, when the program sponsored by the Bituminous Coal Institute was broadcast over radio station WOL.

Mr. Harrington's straight from the shoulder answers to pertinent questions are of significant interest to all coal producers.

WARNER: *Mr. Harrington, every year during the coal wage negotiations, or after a mine explosion, there is a lot of talk about mine safety, or the lack of it. And I think people generally get the impression that not enough is being done to make coal mining safer. You are a pioneer and, as the long-time head of Bureau of Mines safety work, can probably speak with more authority on this score than any other man in the United States. What do you say about it?*

HARRINGTON: Mr. Warner, I say any such impression is false. The contrary is true, although few people realize it. The safety accomplishments of the coal mining industry compare with, or surpass, those of far more prosaic industries. What's more, you probably didn't know that the safety record of the coal mines is a good 250 percent better than the safety record of the United States as a whole.

WARNER: *No, I did not. How do you mean?*

HARRINGTON: In the last 40 years, fatalities in coal mining have been reduced about two-thirds. And in the bargain, America's coal mines now produce 30 percent more coal. On the basis of man-hours worked, coal mining is more than twice as safe as it used to be. And, if you figure it on the basis of tonnage produced, the coal miner's job today is four times as safe as it was 40 years ago.

Now, in those same 40 years, the nation as a whole has reduced its accident death toll only 20 percent. No matter what yardstick you use, it shows the coal industry has put in a lot more effort and made a lot more progress than has the country as a whole.

WARNER: *Well, what about all the injuries we hear about—the ones that don't kill, but maim or cripple?*

HARRINGTON: Mr. Warner, a lot of the talk about coal mine injuries is just plain bunk. Last year, 54,000 injuries were chalked up against the coal industry, and that big figure was the smallest ever reported. If coal miners were being seriously injured at that rate, it would take only eight years to incapacitate the industry's entire working force of 450,000 miners. The fact is that 90 percent of the injuries assessed against the coal industry are of a minor nature.

WARNER: *I don't follow you. How do you account for the contradiction between your claim and the records?*

HARRINGTON: It's our accident reporting system. Any man who gets hurt underground—no matter how, and however slightly—if he loses a day's time, it goes down in the records as an accident.

WARNER: *Well, how many of them* ARE *serious?*

HARRINGTON: Of the injuries reported last year, only about 20—twenty, mind you—out of 54,000 resulted in permanent total disability. About 1300 caused partial disabilities. And the great bulk—or more than 52,000—caused no permanent disability whatsoever.

Persistent education and training in safety—preventive medicine for accidents

WARNER: *Well, I must say that looks like a horse of a different color. I notice you said 1948 had the lowest injury rate on record. Now was last year a typical year, or a lucky exception?*

HARRINGTON: Last year's safety record was both representative and exceptional. But not lucky. It represented one more step forward in a consistent, downward trend in coal mine accidents. It was exceptional in that the great bituminous coal industry established a new all-time safety record.

WARNER: *All that sounds so impressive, Mr. Harrington, how do you account for what is probably a general impression that coal mines don't pay enough attention to safety?*

HARRINGTON: Here is the explanation: It is the mine explosions that make the headlines and they create emotion. It's not unnatural. And I think the managers of the mines are moved even more than the public. These are their men who are injured or killed. They know the harsh effect on the local community. But the outside emotionalism can be used to exploit or magnify the industry's shortcomings while the industry's real achievements in mine safety are ignored.

WARNER: *Tell us about the part the Bureau of Mines has played in these achievements.*

HARRINGTON: Mr. Warner, the Bureau of Mines was created 40 years ago because of a heavy and rising toll from mine explosions. No one in authority then knew what caused them or how to prevent them. The situation was like trying to prevent smallpox without even knowing what caused it, much less how to vaccinate against it.

WARNER: *Well, I take it the Bureau has found out.*

HARRINGTON: We have learned much, Mr. Warner. By investigating every major mine disaster, and by setting off 2000 explosions in the Bureau's own experimental mine, we have learned what causes these explosions and how to prevent or localize them. We have learned the dangers of methane gas and how to avoid them through the use of closed, electric lights which the Bureau developed; through improved blasting procedures; permissible electrical equipment; and through better ventilation. We learned that coal dust was highly combustible and could feed a local gas explosion and turn it into a major disaster. And we learned that dusting the interior surfaces of a mine with finely pulverized limestone renders the coal dust harmless.

WARNER: *You have found all this out but has the industry applied this knowledge?*

HARRINGTON: Yes, it has. Not all in a day by any means. Our recommendations often were entirely new departures—and the operators would frequently tell us we were crazy, and then adopt our recommendations the next year as they saw the light.

Personal and group encouragement promotes safety

WARNER: *Well, just how effective has the industry's cooperation been, Mr. Harrington?*

HARRINGTON: A lot more effective than most people realize. Explosions are being reduced to the irreducible minimum. In any human endeavor, no matter how well run, there will always be the unpredictable stroke of misfortune. But the technique for minimizing explosions is established and is being effectively employed.

WARNER: *The question you've raised in my mind is: What* IS *the biggest hazard in coal mining?*

HARRINGTON: Mr. Warner, the real answer is the coal miner's frequent failure to protect himself. It is his own carelessness. In the record books it is listed as falls of roof and coal—which usually account for 50 to 55 percent of all coal mining deaths—one or two at a time. Next come haulage accidents, with about 18 percent. Explosions now account for only 5 to 10 percent.

WARNER: *What do you mean when you say carelessness is the worst hazard?*

HARRINGTON: Well, take roof falls. Most of them are due to lack of judgment or sheer laziness of the man himself in placing or failing to place roof props as the coal is removed. Carelessness also figures in the haulage accidents, just as it does in our highway accidents.

WARNER: *What percentage of all mine accidents would you say are due to this carelessness?*

HARRINGTON: Probably 75 to 80 percent are due to human failure—just as they are in the home or on the highway. But the coal miner is much more likely to take chances with his life, because by his very nature he is independent as a hog on ice. He doesn't want God, man or the devil to tell him what to do.

WARNER: *Then you think the miner invites trouble?*

HARRINGTON: Yes indeed I do. It might astonish you to hear me say that many explosions are caused by cigarette smoking in the mines.

WARNER: *But certainly, Mr. Harrington, management has a responsibility to prevent smoking in a coal mine.*

HARRINGTON: Yes, of course it has. But the men smoke in spite of everything. They smuggle cigarettes and matches into the mine. And smoking is continuing, irrespective of the safety campaign of the operators, the unions and others.

WARNER: *Now, is anything being done about this, and about other kinds of carelessness?*

HARRINGTON: Definitely. The counter-measure is education. Coal mining companies and the Bureau of Mines collaborate in giving what might be termed college courses in mining safety to supervisors and officials, and more elementary courses to the men. Further, the Bureau has for years given first aid courses. The unions also have an educational program. The objective is to educate every man and every official in every mine on the fundamentals of safe mining, so that he will know the way to do his job safely; be able to spot dangers; and perhaps most important—make him want to do his job the safe, careful way.

WARNER: *All right, now let me ask the $64 question: Where would you place the credit for the advances in mine safety?*

HARRINGTON: Naturally, Mr. Warner, I would say the basis for our progress has been the work of the Bureau of Mines — in finding the causes of mine accidents and then educating the industry so it can avoid or prevent them.

But the coal industry also can take credit for many of the things that have made this progress possible. Mechanization; — adoption of closed lights; — rock dusting; — improved blasting procedures;—and better ventilation. These and other improvements have brought about great reduction in most of the major causes of mine accidents. In fact, because of these improvements some types of coal mining accidents have nearly disappeared.

WARNER: *Mr. Harrington, I notice you said nothing about the miners and their unions. And the question in my mind is: Didn't they do more than the operators by constantly pushing for new safety measures?*

HARRINGTON: No, they did not. The miners bitterly fought the electric cap lamps, permissible explosives, and safety clothing in several states; they and their unions opposed mechanization of the mines, which has done much to save lives. The union agreements with the operators had nothing to say about safety until 1941. And when they did, the union didn't take advantage of it, although currently the union is making itself heard on this score in some areas.

WARNER: *That seems amazing. My guess would be that the miners themselves would be the persons most insistent on more and more safety measres.*

HARRINGTON: The answer is that mine safety is a science, which neither the men or their union officers know very much about.

WARNER: *Mr. Harrington, you've told us that in the last 40 years, a science of mine safety has been developed by the Bureau of Mines; taught to the coal industry; and the coal industry has largely applied the lessons of this science—with impressive results. Now, what do you recommend for the next 40 years?*

HARRINGTON: That's easy—more of the same. More education by the Bureau and more application by the operators and the union.

WARNER: *What about proposals in Congress to give the Bureau power to compel industry to adopt its recommendations—to enforce the Federal Mine Safety Code? Are you in favor of them?*

HARRINGTON: No sir, I most certainly am not. I think any such move would be very likely to cripple the progress of mine safety.

WARNER: *I must say, Mr. Harrington, it's news when a government official—even a retired one—opposes a grant of power for his Bureau.*

HARRINGTON: That, Mr. Warner, is because I want the Bureau of Mines to grow and to glow. If it is given enforcement powers, it will get in the rut of a police job and stay there. The Bureau's job is to see beyond today, to tomorrow, through research and education. You make progress by democratic cooperation; not by dictation and compliance. Today we have an affirmative program for advancing mine safety based on that principle. In addition, we have state and we have federal inspection services. Finally, we have a coal industry that is cooperating by putting this growing knowledge into practice, because it knows that safety and efficiency go hand in hand.

Why cripple the Bureau's vital job of teaching by turning it into a policeman? Why divert the industry's attention and efforts from making its jobs constantly safer to that of day-to-day conformity with a policeman's day-to-day dictates? That isn't the way America or Americans get ahead.

WARNER: *Then you think enforcement legislation would only slow up an already effective program?*

HARRINGTON: I know it would. If Congress wants faster progress in mine safety, then let it do something it has consistently refused to do. Let it give the Bureau of Mines adequate personnel and facilities to learn more and to teach more. The record is eloquent evidence that education can work miracles. Laws aren't the answer. Why, the coal industry has gone far beyond the requirements of what laws there are. Today, Mr. Warner, 90 percent of our coal mines ordinarily don't have a single fatal accident in the course of a year. That doesn't mean the ultimate has been reached, by any means, but the foundation has been firmly placed for continuing the downward trend of mine accidents.

Protective measures reduce mine dust hazards

Electrostatic Separation

Some Pertinent Factors in the Separation of Rutile and Zircon

By FRED D. KAY
Vice-President
International Titanium Corp.

RUTILE, nature's oxide of titanium, with a formula of TiO_2, will usually contain oxides of iron, chromium, vanadium, and other metallic elements. Zircon, the silicate of zirconium with the formula Zr, SiO_4, is usually found absolutely pure and conforming to formula. Most of the facts in this paper have been developed from the separation of these two minerals.

Electrostatic separation, considered as "the art of separating one material from another by electricity," will be discussed chiefly from a production and economic standpoint. Because electrostatic separation is truly an art, the scientific aspects will not be dealt with at too great a length.

Although several patents relating to electrostatic separation were issued prior to 1910, Charles Huff was the first to commercialize by gathering together a group of patents issued to several individuals—Blake, Morseher, Dolbear, Wynne, Pickard, Woodsome, and Wentworth—and to market a truly workable machine. During the period 1910-1926 several electrostatic separating plants were built and operated for the treatment of ores and minerals.

After 1926 competitive processes curtailed the use of electrostatic separation for ores and minerals, although a good deal of work was done in the food and seed processing industries. In this same period, intensive work was done on the structure of electrostatic machines and the sources of high voltage power to operate them. At the present time, there are electrostatic operations in the Florida phosphate field, on beach sands, and some work is being done on coal and in the titaniferous magnetite fields.

Separation of any two unlike particles electrostatically takes place according to a fundamental law that unlike charges attract and like charges repel. The degree to which this attraction and repellance takes place is basically dependent on the conductance of the materials being treated, but is also influenced by:

(1) Contact potential
(2) Pyroelectric qualities
(3) Piezoelectric qualities
(4) Dielectric qualities

The separation of rutile and zircon involves a mixture of two minerals of different conductive values, with rutile being the poorer conductor and zircon a relatively good conductor. The degree of attraction and/or repellance appears to be influenced by the shape of the charge emanating from the electrode, i. e., whether it is a sheet or a ball.

Separation is accomplished by subjecting the material to be separated to an electrostatic charge by passing it between a charged electrode and a grounded electrode.

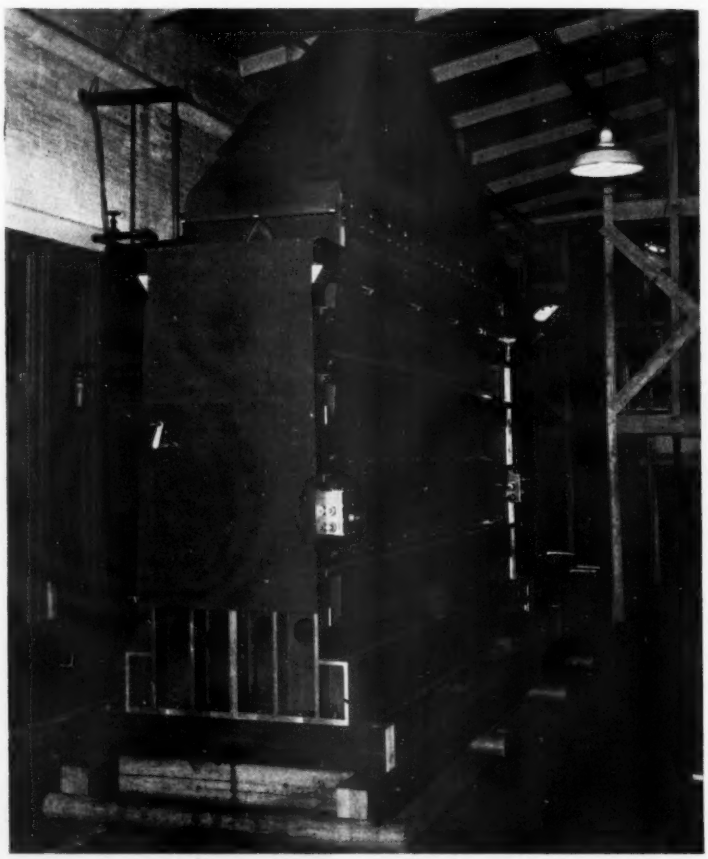
The first electrostatic machines were of the toboggan type in which the materials to be separated were fed between the charged and grounded electrode by sliding down a chute, but these were soon changed to the type using the feed roll as the grounded electrode. Usually the grounded electrode is a revolving roll that receives the material from a vibrating pan feeder. These rolls are made of a highly conductive material, usually brass, and will vary from 3-8 in. in diameter and from 3-12 ft long.

Many kinds of material have been used for the making of charged electrodes, including brass, various alloys, and dielectric materials.

The shapes of charged electrodes in general use are:

(1) Tube or rod, either stationary or rotating
(2) Needlepoint
(3) Wire

In the past a great deal of trouble



Three-electrode separator can treat up to 18 tons per hour by Johnson process

was experienced with the generation and rectification of the high voltage electricity. A large part of this trouble has now been overcome and three main types of power units are in use:

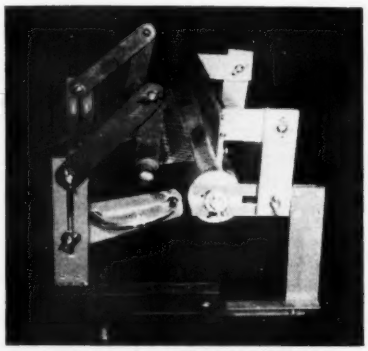
(1) Mechanical—with a motor, exciter and mechanical rectifier synchronized
(2) Transformers with tube rectifiers, but full and half wave
(3) Transformers with dry-disc metallic rectifiers.

Although the tonnage of ore now being beneficiated by electrical methods is relatively small, these processes are becoming more important. Some pertinent data are published here that will be of interest and value to producers treating ores that contain minerals having different conductive properties.

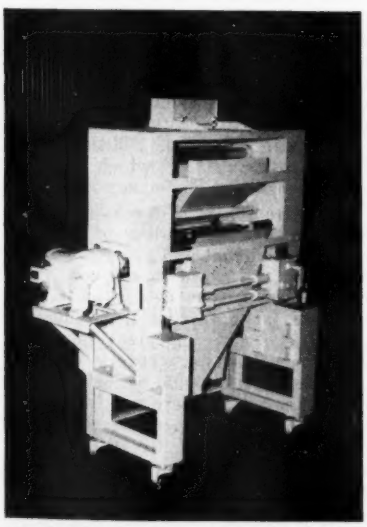
Factors Affecting Separations

The roll or grounded electrode is revolved at speeds varying from 80 to 500 rpm. Roll speed has a definite effect on the separation of rutile-zircon sands, the higher speeds being better for the production of clean rutile and the lower for clean zircon.

The charged electrode may carry from 5000 to 30,000 volts at from 1/10 to 13 ma, but ordinarily the extremely high powers are not resorted to, but are confined to 5000-20,000-V range at 1/10 to 5/10 ma in the processing of rutile-zircon sands. The economic removal of a marketable rutile from the mixture can usually be accomplished at the lower powers.



Grounded roll, needle-point electrodes, and neon tube secondary electrodes as used in Sutton process



A single-electrode separator with a maximum capacity of 850 lb per hour

Either a positive or negative charge can be carried on the electrode depending upon the mixture being treated. There is no way to determine, except by trial, which is the better polarity. Negative polarity has power to give the sharpest separation of rutile and zircon.

Among the many factors affecting electrostatic separation are:

(1) Moisture
(2) Temperature
(3) Classification of sizes
(4) Dust
(5) Grounding

Moisture and/or temperature are definitely related in electrostatic separation and are a factor or factors affecting such a separation. Although there is no reason to believe that the moisture content of a mineral has any effect on its behavior in electrostatic separation, surface moisture will definitely prevent most separations. This is the case in the separation of rutile-zircon sands.

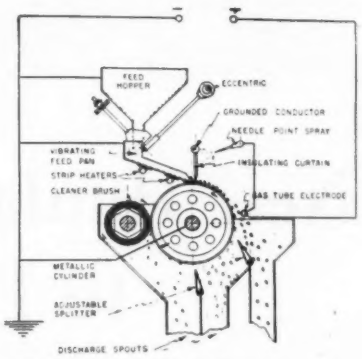
Extremely high humidity has been known to affect electrostatic separations, including those of rutile and zircon, but this condition can usually be corrected by the proper application of heat.

Removing rutile from a rutile-zircon mixture is done at an optimum temperature of 140-180 F. This temperature is best attained by heating to a temperature in excess of 212 F to assure surface dryness, and subsequently cooling the mixture to the required temperature. Such treatment decidedly activates the rutile and aids separation. Unfortunately, it also activates the zircon and hinders the production of a clean product. Consequently, the zircon-enriched sands are allowed to cool to about 100-110 F before being processed for the production of clean zircon.

Desliming and classification are as much a factor in electrostatic separation as in other ore dressing. Most minerals coarser than six mesh and finer than 200 mesh are not amenable to electrostatic separation. The degree of classification made prior to separation depends largely on the economics involved, but separation into two parts is usually sufficient. As most beach sands that give a rutile-zircon concentrate are well classified by nature, no further classification is necessary.

In electrostatic separation, the larger the particle, the closer it will fall to the dividing edge, indicating there is some selectivity according to size. In fact, such selectivity is the basis of an electrostatic sizing machine.

Dust is the slime of electrostatic separation and, like all slime, is a constant source of trouble. It has a tendency to coat electrodes, form false grounds, and otherwise become a general nuisance. Particle sizes less than 200 mesh are generally undesirable in all electrostatic processes, including rutile-zircon. However, it may be possible to handle sizes down to 325 mesh if closely classified.

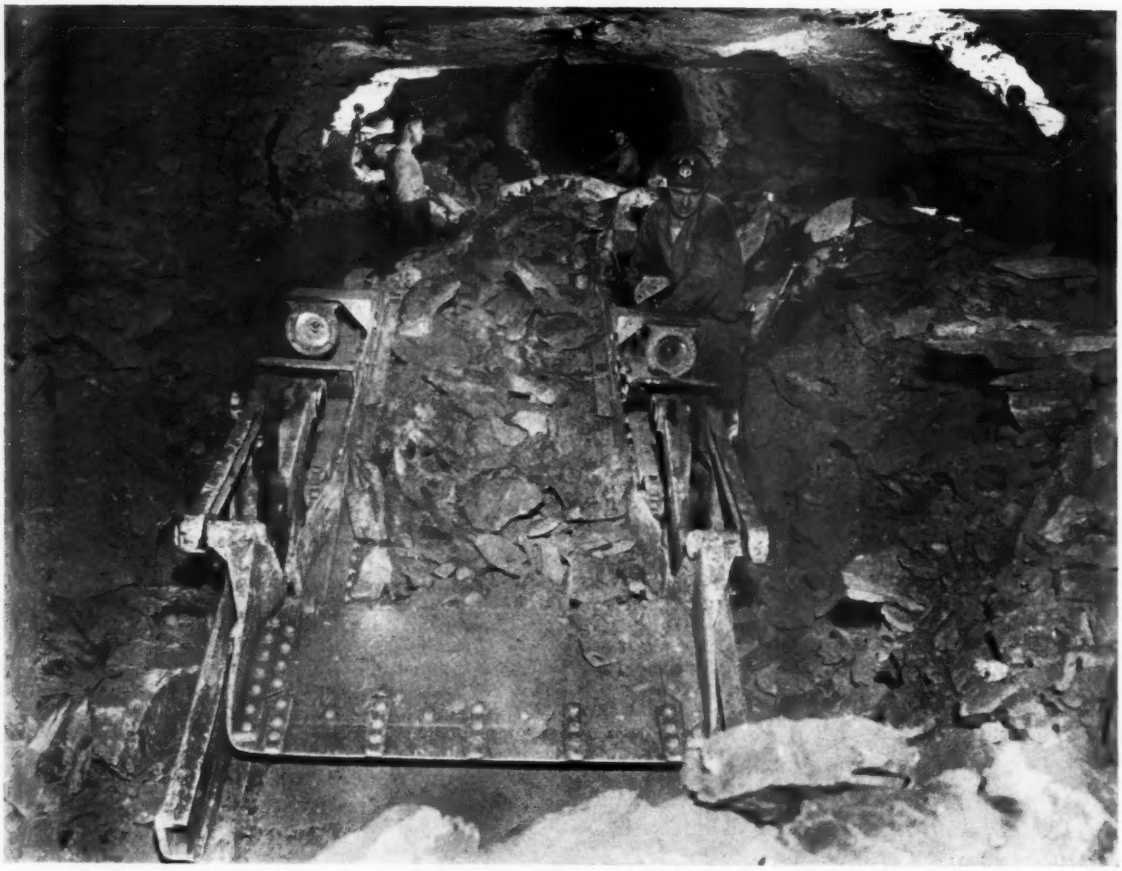


Sutton process electro-float separator

Control of the relatively high voltages used in electrostatic separation is one of the major problems in operating. Complete and as near perfect as possible grounding is required for good control and operation. Good insulation confining the static charge to the operating zone is another necessity. This is true of all separations, including rutile-zircon, where definite improvements have been gained by improving the grounding and insulation.

The following flow-sheet for the production of rutile and zircon from a rutile-zircon head feed is entirely

(*Continued on page 49*)



Coal loaders handled rock efficiently

New Haulage Tunnel to Price Preparation Plant

Undulating Coal Seam Complicates Driving

By J. PERAINO
Assistant Chief Engineer
Inland Steel Co., Wheelwright, Ky.

IN May 1946, the Inland Steel Co. purchased 10,700 acres of Elkhorn No. 3 seam coal which increased its holdings to about 30,000 acres. Included in the purchase were 577 acres of surface lands.

Part of the 10,700 acres adjoins the Wheelwright mine of the company on the north, but a large portion of the new property is separated from the main property by Left Beaver Creek.

The Elkhorn No. 3 seam of coal in Eastern Kentucky is a high grade metallurgical coal. The seam is characterized by faults and an extremely undulating bottom, and Inland's mining operations, which extend into three counties, encounter a wide variety of mining conditions. There is clean coal varying from 30-48 in. in thickness, also partings that will be mined with the coal. The coal seam is overlaid with sandstone in a few sections, but the predominant top is a slate that requires close timbering.

Inland had known for some time that eventually it would be necessary to install a coal cleaning plant to beneficiate the mechanically-mined coal. But the decision as to the type of plant and its location could not be made until it acquired additional coal lands, the purchase of which had been under consideration for several years.

With the advent of mechanical mining, the separate loading of machine cuttings and coal and the removal by hand of draw slate in the coal have resulted in serious delays in mining and are large factors in production costs. The cleaning plant also will make possible the recovery of coal, which otherwise would be lost, located in certain areas where parting conditions exist. Besides the recovery of the additional coal in those areas, there should result a better over-all operating efficiency and lower production costs because of the added working height. The coal shipped after cleaning will be uniformly low in ash

and sulphur and this is essential to the efficient operation of Inland's blast furnaces.

There were many good reasons why the cleaning plant should be built at Price. The location of the present tipple at Wheelwright is congested so badly it would have been impossible to find room for the size plant being constructed. The quantity of water required for the operation of the plant can be obtained from Left Beaver Creek at Price, but not at Wheelwright. The center of gravity of the mining operations will be moving towards Price in future years. The present refuse disposal area at Wheelwright is practically depleted and additional disposal area nearby is not available.

Production of coal during construction of the new plant has continued unhampered and when the Price plant is completed, the coal will be diverted to Price with no loss of time or production in making the change-over. The present tipple will eventually be scrapped and the Wheelwright town will be relieved of a great dirt nuisance, train traffic, traffic congestion, and excess noise, and consequently will be a far more desirable place in which to live.

Temporary Mines Speed Tunnel Construction

When it was definitely decided to build the Price plant, there was approximately 4½ miles of tunnel to be driven to connect the existing workings with the new head house location. Driving from one end only, it would not have been possible to drive that distance and establish a haulage system in the time that would be required to complete the plant.

In order to be able to utilize the new plant as soon as completed, two temporary mines were opened with the necessary tipples, chutes, dumps, refuse disposal facilities, shops, etc. The first temporary mine was put in at Buckingham about one third of the way from the Wheelwright mine workings to Price. A 2/3 mile railroad spur track had to be installed to the tipple site, and in the middle of December 1946 the mining of coal was started. To intersect the projected main tunnel, 1000 ft of entry had to be driven. When the projected main tunnel was reached, the tunnel driving was directed towards the Wheelwright workings for a distance of 600 ft. Then the direction of mining was reversed towards the Price mine.

Additional coal lands acquired by Inland Steel Co. raised the problem of a central preparation plant where coal from all properties could be treated. A long tunnel was driven to join output from several mines. This is the story of the methods employed in driving this tunnel that required an unusual amount of rock work.

The second temporary mine was installed at Price just beyond the new plant location and on May 1, 1947, mining was started there in the direction of the Buckingham mine.

Before the tunnel was projected it was necessary to extend a triangulation system on the newly-acquired property at Price and also at Buckingham. Gas wells, creeks, and some outcrop had to be located by survey and the tunnel was then projected with the least number of curves possible to avoid gas wells and to stay sufficiently far away from the outcrop. The curves used were of 2000 ft and 5500 ft radii so that high speed could be maintained through the tunnel with good visibility.

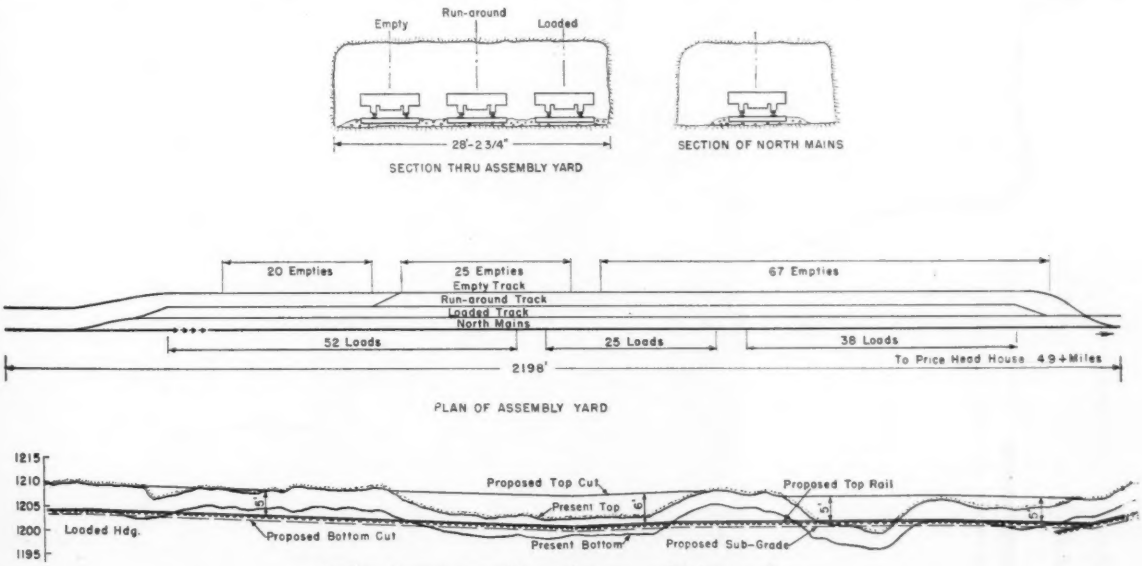
Four places were driven between the Wheelwright Mine and Buckingham Mine and three places were driven the remainder of the distance.

In the Wheelwright Mine, two shuttle cars and a caterpillar-mounted loading machine were used. Approximately 18-24 in. of rock were taken in the main heading on the advance. Most of the rock in the air courses was timbered and held.

The Buckingham Mine operated with the same kind of equipment as the Wheelwright Mine and with the same size crew. Approximately 24 in. of rock were taken on the advance in the main heading and most of the slate in the air courses was also taken on the advance.

At the Price Mine two caterpillar-mounted loading machines were used and these loaded onto chain conveyors. An average of approximately 3½-4 ft of rock were taken on the advance in the main heading and approximately 50 percent as much rock was handled in each air course.

Grading of the main heading was



Section through assembly yard shows undulating coal seam

GENERAL PROPERTY MAP
INLAND STEEL COMPANY
10,700 ACRE TRACT
PRICE MINE
PRICE MEN PLANT
BUCKINGHAM MINE
MEN TUNNEL
½ MI. R.R. SPUR
ASSEMBLY YARD
WHEELWRIGHT MINE
WHEELWRIGHT
CONCRETE TIPPLE
WESTERN POCAHONTAS CORPORATION TRACT
T.A. MARTIN TRACT
WEEKSBURY
CLEAR CREEK
BEAVER
RIGHT
PRESTON
KNOTT
FLOYD
LETCHER
PERRY
RIGHT FORK OF LOST ROCK

done intermittently and the rock was loaded with both mobile coal loading machines and track-mounted rock loading machines.

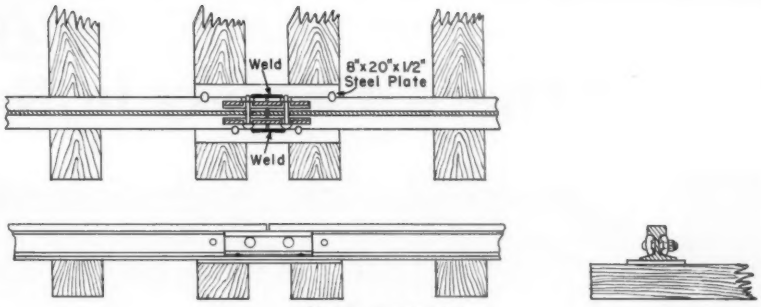
Grading Required Much Rock Work

In the Wheelwright Mine, grading was done while the face advanced by laying track in an air course for the face haulage. But in the other mines the face had to be stopped to permit grading because of the shortage of mine cars in these mines. The Wheelwright Mine uses a rotary dump, but for the Buckingham and Price Mines drop-bottom cars were purchased. Because the drop-bottom cars cannot be converted for use in the rotary dump, the number of cars purchased was kept to a minimum.

When working on advance only, the approximate average advance made in any one mine per month was about 450 ft in rock and coal for two shifts. The maximum total advance made for the three mines in any one month was 1775 ft in both rock and coal.

The Wheelwright Mine cut through to the Buckingham Mine on June 5, 1948, and Price Mine cut through to the Buckingham Mine on December 24, 1948.

The mining conditions encountered in the driving of this long tunnel were bad most of the way. For about 2000 ft the clean coal thickness averaged 46 in.; over the remaining distance the clean coal thickness averaged 38 in. In some sections of the tunnel as much as 2-5 ft of slate or slate and laminated coal had to be handled and loaded out as refuse as the tunnel advanced and prior to the final grading.



Sketch of rail joint

The general dip of the coal seam toward Price is less than 1 percent, but in the driving of the tunnel there were many undulations encountered with natural grades too severe for main line haulage. All track grades were laid out by the engineering department and established underground for the grading of the permanent track. The average grade for all track within a full trip length was held to not more than 1.25 percent against the loads. There were two exceptionally large grading jobs required to hold the maximum grades within the limits established. One unfavorable grade of 1.25 percent extended 1250 ft and required the shooting down of a maximum of 14 ft of top rock and the taking up of a maximum of 5 ft of bottom rock with a total average of 9.4 ft of rock. Approximately 7400 cu yd or 17,000 tons of rock had to be handled in the making of this one section of haulway alone.

On the second large grading job, an unfavorable grade of 1.25 percent extended 1075 ft and required the shooting down of a maximum of 9 ft of top rock and the taking up of a maximum of 4 ft of bottom rock.

Haulage Equipment

On all main line haulage in the Wheelwright Mine 60-lb rail is used; but for better traction and in order to maintain a faster and safer shuttle haulage through the new tunnel to Price, 80-lb rail has been used and laid on 5 by 7 creosoted ties.

The track joint used consists of a ½-in. steel plate, about 8 by 20 in., under the joint and spanning across two ties. The rail is spiked down through holes in the plate and the base of the rail is also welded to the plate; the rail ends are not welded at all, but are held firmly in place with half length splice bars. It has been found by test that the electrical efficiency of the joint is better than of the solid rail.

There will be only one continuous track through the tunnel from a trip assembly yard in the Wheelwright Mine to a point within 2500 ft of the Price head house, and two tracks from that point on. Four passing tracks in the tunnel with an automatic block signal system to control traffic should reduce delays to a minimum.

Five 15-ton locomotives will shuttle between the assembly yard and the head house at Price. They will haul 60 car trips, each car carrying a net load of approximately 2¾ tons. Coal mined between the assembly yard and the Price head house will either be picked up by the shuttle trams from sidetracks at the mouths of the entries, or hauled directly to the head house by local trams. All coal from the Wheelwright Mine inby the assembly yard will be hauled to the yard by 15-ton locomotives in 40-car trips, as track grades inby the yard are too severe for handling longer than 40-car trips.

All loaded and empty trips between the assembly yard and Price Mine head house will be controlled by the

(*Continued on page 49*)

Final connection of 4½-mile tunnel driven from Wheelwright Mine and Price Mine

"There's Safety in *these* Numbers"

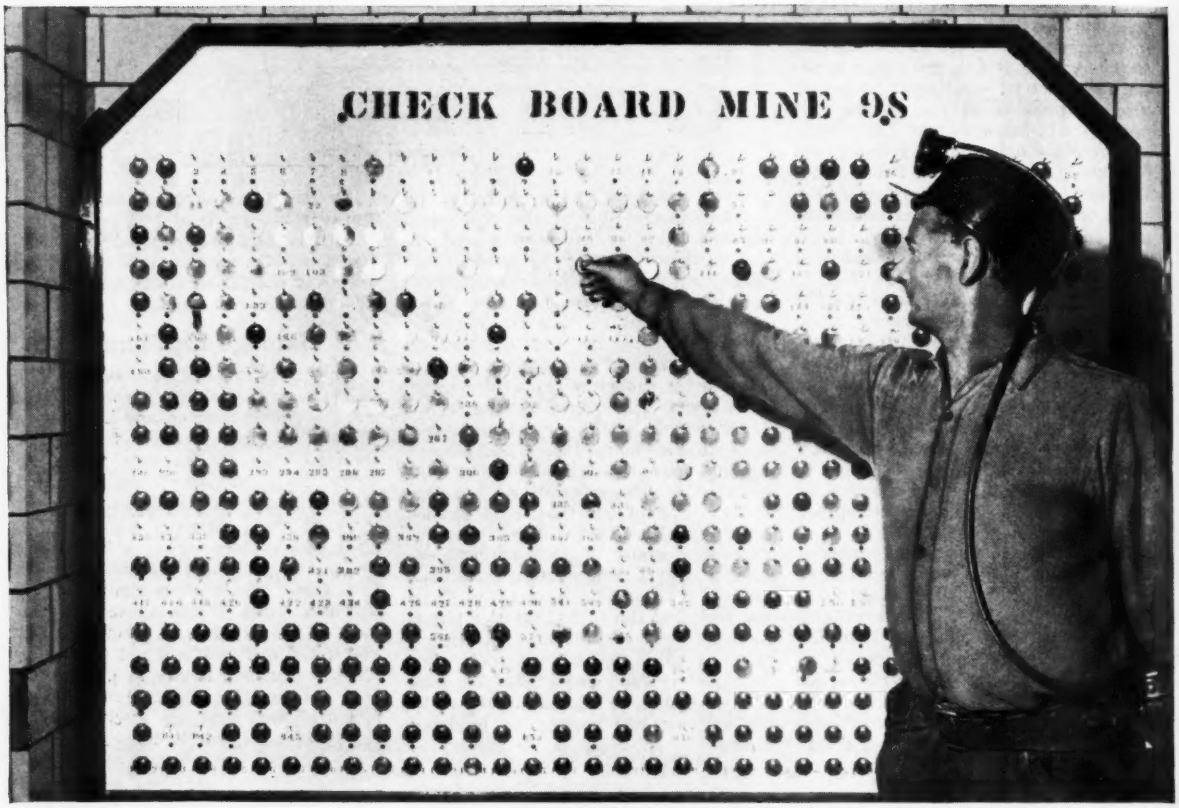


Photo taken in Northern West Virginia coal fields by William Vandivert

When a man goes underground in most modern coal mines, he removes an identification tab from a board like the one shown here. It provides a visual check on *each* man, which is as basic a step in any mine-safety program as "counting the noses" in a large family after a day at the county fair.

This simple measure is one of dozens of practices aimed to make mining safer. Indeed, modern mining techniques make it possible to offset almost every hazard of mining except one—and that is the natural human tendency to become calloused to danger.

In fact, U. S. Bureau of Mines records show that individual carelessness, not spectacular mine disasters, add up to the big majority of *all* accidents. That's why trained safety experts strive to make *all* miners safety-minded, every hour of every day. Beyond that, the industry invests over 80 million dollars *annually* in health and safety equipment. As a result of co-operative efforts among operators, unions, and government, last year's coal mining safety record was the best since the Bureau of Mines first began keeping figures *over 39 years ago.*

Any discussion with mine safety experts about safety in America's coal mines winds up in agreement on one point. The problem of mine safety is a problem in human nature.

That's why the industry, through the efforts of its industrial mine-safety supervisors, works hard to popularize mine-safety concepts. They not only talk safety, display safety measures in specially designed posters, but even "slo-ganize" safety. One example of this last is the use by miners of the phrase *"Be careful"* as a casual greeting whenever and wherever they meet each other in the mine passageways underground.

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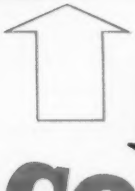

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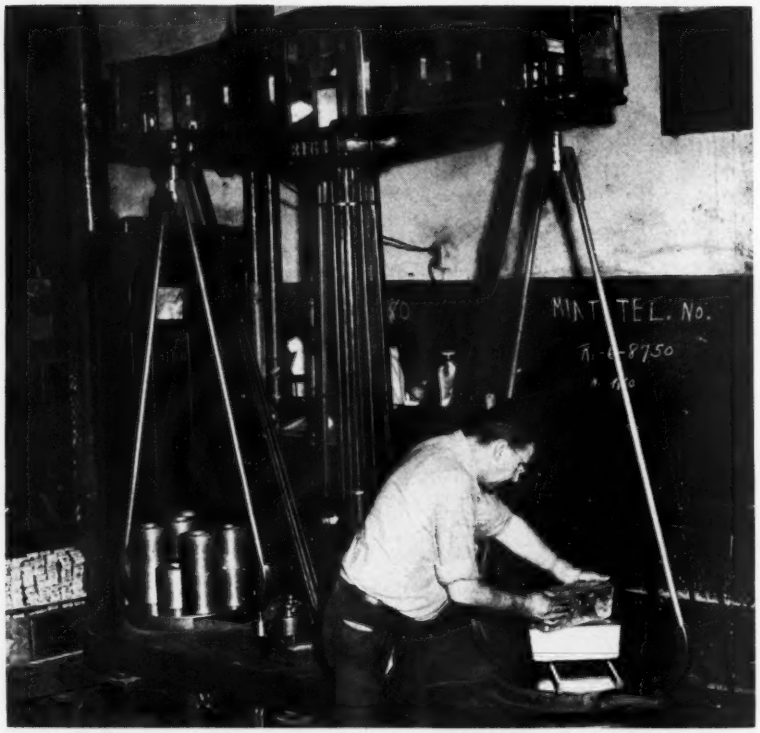


Weighing up a "melt" of silver and copper in proportions of 90 parts silver and 10 parts copper

Making Money

How U. S. Mints Operate in Producing Coinage

Pouring molten alloy of silver and copper into coinage ingot molds

By LELAND HOWARD
Acting Director of the Mint

AFTER the American Colonies had achieved independence, it became their sovereign right to provide a coinage, which was promptly considered by the National Congress. Some of the states considered it their duty to furnish their citizens with an ample supply of small coin and to eliminate from circulation the vast amount of light-weight and spurious copper coins then commonly current. On April 21, 1787, a congressional committee made a report in favor of the coinage of copper and entered into a contract with a Mr. James Jarvis to coin for the National Treasury, three hundred tons of copper. Before this contract was carried out, there arose a difference of opinion in Congress regarding the wisdom of parts of it; but there is no record of how the difficulty was finally adjusted, and it seems probable that Jarvis insisted on having the terms adhered to and struck the coins. The coins of the Federal Congress were struck chiefly in New York, but the mint requirements of the time enabled the contractor to sublet portions of the contract, if he so desired, and the fact that some of these copper coins were also struck at New Haven, Conn.; at Rupert, Vt.; and at other places, suggests that the contract was actually farmed out.

Besides the Congress, Vermont, Connecticut, New Jersey and Massachusetts, likewise proceeded to coin copper. The first of these to start the movement was Vermont, a commonwealth that had not formed one of the original 13 colonies which revolted and was not at this time a state, being admitted into the Union in 1791. In 1785, Connecticut also passed an act providing for a contract to coin 10,000 lb of copper, the contractors to pay over to the state five percent of the total amount coined. The coins of Connecticut, like those of Vermont, closely resemble the English halfpenny.

The Act of Assembly that provided for the coinage of copper in New Jer-

The conversion of metals into coinage is a significant phase of Government activity. Thousands of tons of metal are used annually and, although not now coined, a considerable tonnage of gold is refined each year to augment stocks aggregating over $24½ billion. Some history of U. S. mints is outlined here along with details of mint practices and metal consumption.

sey was passed June 4, 1787. It authorized a contract with a Mr. Walter Mould and his partners, Thomas Goadsby and Albion Cox, for the coinage of 10,000 lb of copper. Mr. Mould established his private mint at Morristown, while Goadsby and Cox coined at Elizabethtown.

Massachusetts established a mint instead of contracting with a private firm for the manufacture of coins and also proposed a much more extensive coinage than any of the other states, aiming to strike the precious metals as well as copper. The advent of the Union and the constitutional provision for an exclusively national coinage speedily ended all the state had planned to do.

The Mint of the United States was established at Philadelphia by act of Congress dated April 2, 1792. The act established the monetary system of the country and a mint, provided for the free coinage of both gold and silver, fixed the legal ratio of the values of the two metals at 15 to 1, and provided for a token coinage in copper. The first coins were struck at the new mint in March of the following year. Subsequently, several mints were established in different parts of the country.

Prior to the passage of the Coinage Act of 1873, the mint at Philadelphia was known as the United States Mint and was under the personal supervision of the director of the mint. The others were known as Branch Mints of the United States, including those of New Orleans, La.; Charlotte, N. C.; and Dahlonega, Ga., which were all established in 1835, together with the mint at San Francisco, established in 1852, and that of Carson City, Nev., in 1870.

The mint at New Orleans was suspended in 1861, reopened in 1879 and discontinued in 1910. The coinage of the mints at Charlotte and Dahlonega was restricted to gold. They were closed in 1861. The mint at Carson City was closed in 1893. The mint at Denver was established in 1906.

By provisions of the Act of 1873, the Bureau of the Mint was established at Washington, as a division of the Treasury Department, and the mint at Philadelphia placed under the immediate supervision of a superintendent, the same as at the other mints. The functions of the Bureau of the Mint are fully provided by the revised statutes and further indicated by special provisions of subsequent appropriation acts.

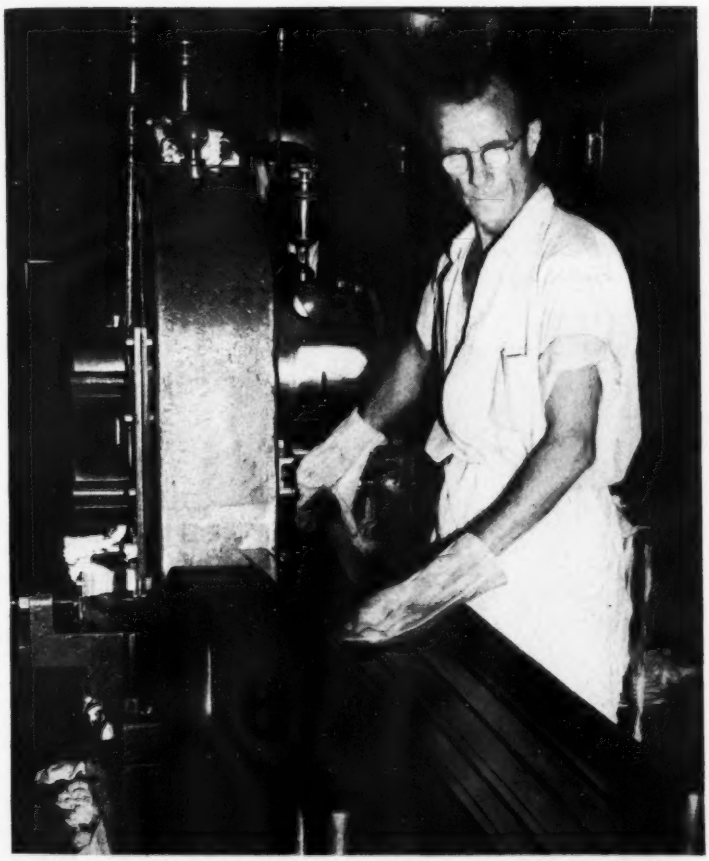
The principal functions of the mint service consist of the manufacture of domestic coins; the safeguarding of the Government's holdings of the monetary metals, including coins in processing stages until finished and issued; and the acquisition of gold and silver bullion, payments for which are made on the basis of mint assays. Other major activities include the refining of gold and silver; the manufacture of coins for foreign governments; the issuance of Treasury licenses for the acquisition, ownership, possession, and use of gold for industrial, professional, and artistic purposes; and the production of medals and other decorations.

Seven field institutions were in operation during the fiscal year 1948: Coinage mints at Philadelphia, San Francisco and Denver; assay offices at New York and Seattle; gold bullion depository at Fort Knox; and silver bullion depository at West Point, which operates as an adjunct of the New York Assay Office. The office of the Director of the Mint in Washington administers all mint service activities.

Coinage production by the three mints during the fiscal year 1948 total 802,922,066 pieces, of which 51,248,367 were foreign.

The coins for other governments required approximately 350 tons of metals, including gold, silver, copper, nickel, tin, and zinc, processed into coin for the governments of the Dominican Republic, Ecuador, El Salvador, Ethiopia, Philippines, Saudi Arabia, and Syria. The domestic coinage required 3160 tons of metal.

The medal department is located at the Philadelphia mint. Medals and other decorations authorized by the



Running coinage ingots through rolling mill to obtain strips of proper size

armed services constituted the bulk of the work in 1947 as for the past several years. The medals and other distinguishing devices for the Army, Navy, Marine Corps, and Coast Guard totaled over 2,400,000 pieces during 1947. In addition, there were 426 private medals made and 5649 commemorative list medals sold from regular stock.

All coinage and medal dies used by the mints are produced by the engraving department located at the Philadelphia mint. During the fiscal year 1947 the department issued 15,930 working dies for domestic coinage; 5010 working dies for foreign coinage; 436 dies, hubs, etc., for medals and insignia; seven sculptured models; and other items—a total of 21,746 issues during the year.

Electrolytic refineries are maintained at the San Francisco, New York, and Denver institutions. During the fiscal year 1948 the refineries operated upon approximately 300 tons of metal. The electrolytic output amounted to 2,629,403 fine ounces of gold, and 1,999,351 fine ounces of silver. In addition, 2,228,465 fine ounces of gold and 59,113 fine ounces of silver were subject to fire process only.

Gold issue bars manufactured in 1948 numbered 170,711, and contained 59,863,942 fine ounces of gold with a value of $2,095,237,977. Silver issue bars manufactured in 1947 numbered 964, and contained 229,692 fine ounces of silver. In addition, the New York Assay Office manufactured 603 gold ingots containing 58,640 fine ounces, and 210,883 silver coinage ingots containing 7,442,881 fine ounces for use at the Philadelphia Mint.

The aggregate quantity of metals operated upon in the melting and refining department and the coining department of the three mints and the New York Assay Office during the fiscal year ended June 30, 1947, totaled 2188 tons of gold and 5579 tons of silver. There were also operated upon at the mints 7149 tons of minor coinage metals.

Weigh-In System

All bullion deposited at the United States mints and assay offices is weighed in the presence of two mint employes, each of whom makes a separate check on the weight of the deposit. The weights are recorded in troy ounces and hundredths of a troy ounce. Deposits are numbered and recorded in numerical sequence and, thereafter, complete records are established with reference to each showing before melting weight, after melting weight, fineness, number of fine ounces of gold to thousandths of an ounce, number of fine ounces of silver to hundredths of an ounce, the value of the deposit, and the amount of the charges thereon.

When bullion is transferred within a mint or assay office, each department is charged, or credited, with the exact number of fine ounces of gold or silver involved. In the case of gold the charges and credits are made to a thousandth of a fine troy ounce, while in the case of silver transfers are recorded to a hundredth of a troy ounce. Each department maintains its own accounts showing the exact number of fine ounces of metal in their possession and, in addition, controlling accounts are maintained by the superintendent showing the balance charged to each department.

General statements of accounts with physical inventory of bullion, coin, currency, etc., are made at least once each year under the immediate supervision of a committee assigned by and representing the Director of the Mint. At the time these settlements are made, all values on hand are delivered by their custodians to the joint custody of the settlement officers and representatives of the superintendent of the mint or assay office, together with itemized schedules from which the items may be checked and verified against the balances officially charged to each department. These settlements must be made once in each year and are usually effected in May and June.

All deposits consisting of bars, lumps, grains and dust, jewelry, and dental scrap free from foreign substances, etc., are melted when re-

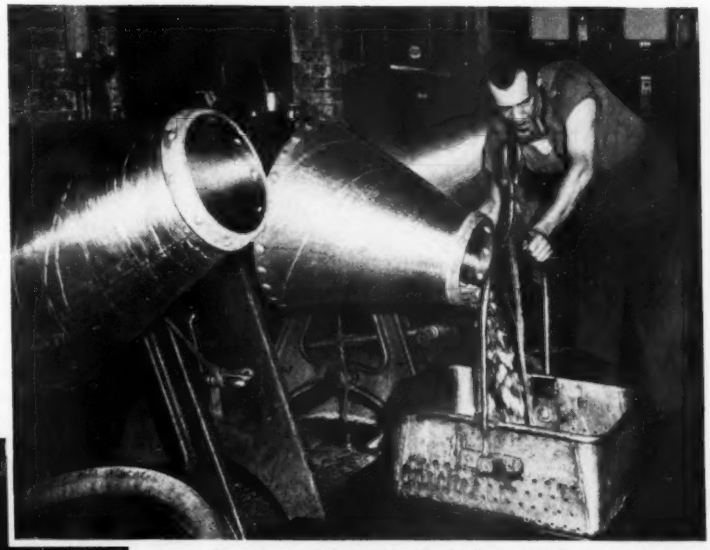
Feeding strips into cutting press, which stamps out coin blanks

Pouring coin blanks into the riddle, or sieve, to sort out imperfect blanks

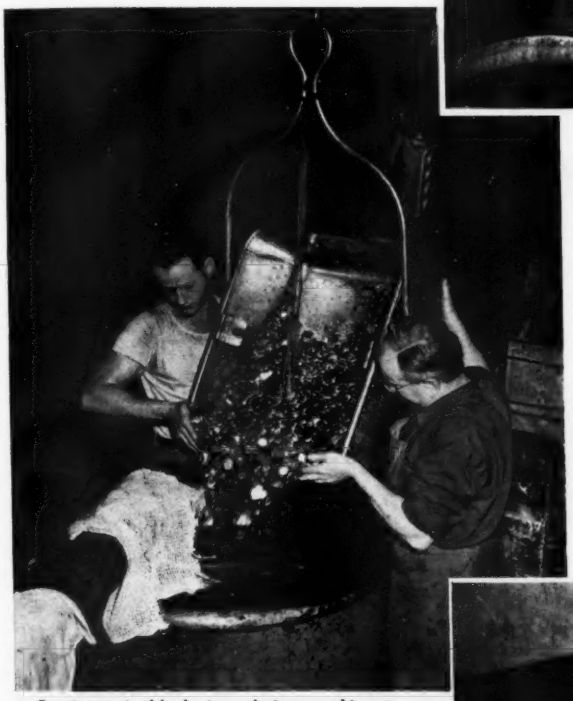
ceived, to render the mass homogeneous. Each lot is melted separately and assayed.

Charges which are estimated to cover the expenses of the operations required to bring gold and silver contained in deposits into a fine condition are fixed by the Director of the Mint with the approval of the Secretary of the Treasury. The subjects of charges are deposit melting and the parting or refining of the metals.

All deposits which contain more than 800 thousandths of base metal, or less than one troy ounce of gold, must be rejected. Rejected deposits are subject to payment in cash of such charges as have been incurred up to time of rejection. After melting, assay and purchase, the unrefined bullion containing gold, silver and impurities is sent to the refinery department. Here it is cast into anodes and refined electrolytically.



Emptying polished coin blanks from tumbling barrels



Pouring coin blanks into drying machine to remove moisture accumulated in tumbling barrels

The early parting processes used in the United States mints were the nitric acid process and the sulphuric acid process. They were abandoned many years ago and replaced by electrolytic methods of refining. The Moebius and Balvach systems are used for silver refining and the Wohlwill process for gold refining.

Domestic silver coins are made from an alloy of 90 percent silver and 10 percent copper. The alloy for the 5c piece is 75 percent copper and 25 percent nickel, and that for the cent is 95 percent copper and 5 percent zinc and tin. Weighed quantities of the component metals are melted together in crucibles in high frequency electric induction furnaces and poured into cast iron molds to form ingots.

Coins Struck at High Speed

The silver ingots are cold rolled by means of two-high rolling mills. They are passed through the mills a sufficient number of times to bring the thickness of the resulting elongated strip down to that of the blanks required to make the coin that is in process of manufacture.

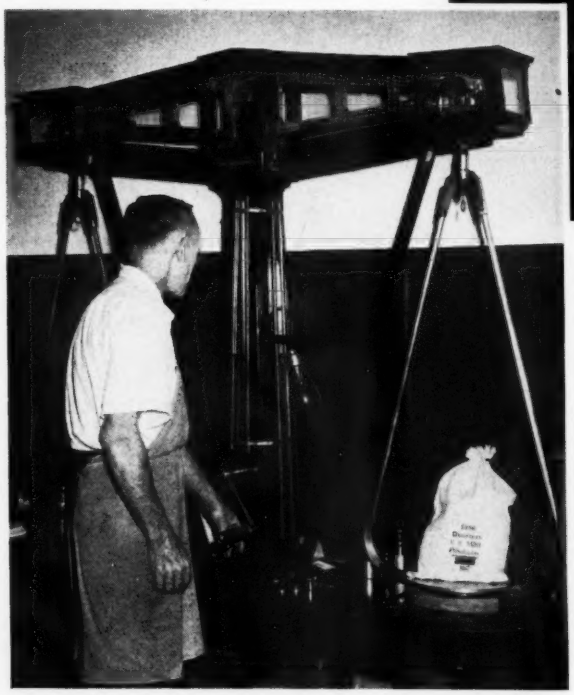
The strips are then passed through cutting presses which punch the blanks therefrom. The perforated strips, called "clippings" are remelted and the blanks are annealed in gas-fired, rotary retort furnaces to soften them for the imprint of the dies and then cleaned and burnished in tumbling barrels. They are then taken to the milling machines and each piece has its edge evenly forced up in a border, or rim. In the milling machines, the blanks

Feeding coin blanks to upsetting machines. When the blanks leave this machine they have a raised edge

Above: Weighing the coin blanks on automatic scales which reject blanks if they are too heavy or too light

Right: Feeding the coin blanks to the coinage press. Finished coins emerge at lower right

Below: Weighing newly-minted quarters verifies machine count



are caused to rotate in a horizontal plane in a groove formed on one side by a revolving wheel and on the other by a fixed segment of corresponding groove. Each piece as it passes through this narrow groove has its edge evenly forced up into a rim. The milling protects the coin from abrasion. Each half dollar and quarter blank is weighed on automatic scales and all pieces that are above or below the legal weight (including the tolerance allowed) are condemned and remelted.

The good blanks then go to the coining presses where they are stamped. They are fed to the press through a vertical tube and as each piece reaches the bottom of the tube, steel feeders carry it over between the dies, place it in a steel collar, when the dies close on the blank and the obverse and reverse impressions are made simultaneously. The inner rim of the collar is reeded or fluted and the blank before being struck is slightly less in diameter than the collar; but the pressure upon the dies causes the piece to expand in the collar and takes from it the reeding on its edge. Coins are struck at the rate of 100-125 per minute, depending upon their size.

The process of manufacture of nickel and bronze coins is similar to that of silver coins. These minor coinage blanks are not weighed individually, but test weighings of the blanks are made at frequent intervals.

Silver coins are counted and weighed in draughts of $1,000 before being packed for delivery. Five cent pieces are delivered in draughts of $200; and 1c pieces in draughts of $50.

From each delivery of finished coins by the coiner to the Superintendent of the Mint a certain number of pieces are indiscriminately taken, sealed in a container, and placed in the pyx for the annual test of the coinage which is made by a commission constituted by law for that purpose. The pyx is kept at the Philadelphia Mint and sealed coins from the San Francisco and Denver Mints are forwarded and deposited in it.

The assay commission meets at the Philadelphia Mint in February of each year. In the presence of the Director of the Mint, the commissioners examine and test the fineness and weight of the coins reserved by the several mints for this purpose. If it appears by such examination and test that these coins do not differ from the standard fineness and weight by a greater quantity than is allowed by law, the trial is considered and reported as satisfactory. If, however, any greater deviation from the legal standard

(*Concluded on page 61*)

WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

SOME observers now feel that it will be September before Congress can leave Washington, especially if the members wish to avoid being called back for a special session later in the Fall. A number of important appropriation bills are retarding action on the arms program for Europe, reciprocal trade extension and minimum wage increase.

There seems to be little chance for any excise tax reduction measure at this session. Chairman Doughton of the House Committee on Ways and Means apparently stands ready to pigeon-hole any such bill which may come over from the Senate, although the feeling is general that the three percent excise tax on freight should be repealed.

Wage-Hour

Senate consideration of a bill to increase the minimum wage from 40¢ to 75¢ an hour has been delayed by consideration of appropriations and other measures, although the minimum wage bill has been the "next order of business" for over two weeks. When and if considered, it will meet with determined opposition from Southern Senators.

In the House, Chairman Lesinski of the Labor Committee is expected to try for early action on his bill which has been dormant in the Rules Committee and which, in addition to increasing the minimum to 75¢ an hour, would greatly expand the coverage of the Wage-Hour Act. If Lesinski is successful in getting floor consideration for his bill, a Republican-Southern Democrat coalition is expected to drive for the substitution of the Lucas bill. This measure would set a 65¢ minimum, adjustable upward or downward in future years in line with the cost-of-living index.

Overtime-on-Overtime

On July 20 the President signed the overtime-on-overtime bill, following House approval of the Senate version by a vote of 207 to 52. This law, discussed in the July issue, excludes from the regular rate of pay, for purposes of overtime compensation, the premiums paid for Saturday, Sunday and holiday work, and for work at undesirable hours. It applies retroactively to all industries and has been estimated to bar claims which ran as high as $300,000,000.

Basing Point

Senator O'Mahoney of Wyoming believes that an agreement can be worked out on the provisions of the basing point bill, S. 1008, which was so amended by the House that it, in effect, bans the defense of "good faith" against charges of illegal use of freight absorption. O'Mahoney urges that there be a clear understanding of the twin objectives of this freight absorption measure (1) that freight absorption and delivered price practices are not per se illegal under the Robinson-Patman Act and (2) to clarify the present language of the Robinson-Patman and Clayton Acts.

Import Duties

Senators and Representatives from mining States are actively pressing bills which call for repeal of the Act under which the import tax on copper is suspended until June 30, 1950. The Senate Committee on Finance will conduct a hearing on this matter and will at the same time consider a House-passed bill which calls for a further suspension through June 30, 1950 of the import duty on ferrous and nonferrous scrap. The bill defines "scrap" as "all ferrous and nonferrous materials and articles, of which ferrous or nonferrous metal is the component material of chief value, which are second-hand or waste or refuse, or are obsolete, defective or damaged, and which are fit only to be manufactured."

Primary nonferrous metal producers from all over the country are urging that the nonferrous feature of the bill be deleted.

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Washington Highlights

CONGRESS: Struggling with logjam
WAGE-HOUR: Southerners oppose high minimum
OVERTIME-ON-OVERTIME: New law enacted
BASING POINT: Still in controversy
IMPORT DUTIES: Nonferrous producers protest further suspension
INDEPENDENT CONTRACTORS: May be placed under Social Security
UNION MONOPOLY: Under investigation
COAL NEGOTIATIONS: Again suspended
COAL MINE INSPECTION: Neely bill reported to Senate
INCENTIVE PAYMENTS: More bills introduced
MINING CONTRACT CLAIMS: New bill follows veto

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Independent Contractors

In its protracted consideration of amendments to the Social Security Act, the House Committee on Ways and Means has adopted a definition of "employe" which includes "a lessee or licensee of space within a mine when substantially all of the product of such services is required to be sold or turned over to the lessor or licensor." This is aimed directly at block leasers, split-check leasers and tributers, who have thus far not been subject to the provisions of the Act. The proposed action of the Committee would result in repeal of the Gearhart resolution of the 80th Congress which applied the common law definition of "employe" to determinations of coverage under the Act.

As now contemplated the term "employe" would also include contract loggers, all officers of corporations, common law employes, individuals performing work under written con-

tracts in which they are expressly termed employes, outside salesmen in the manufacturing and wholesale trade and house-to-house salesmen.

Union Monopoly

The Senate Committee on Banking and Currency is currently conducting hearings in an investigation of the monopolistic practices of labor unions. Senator A. Willis Robertson (Dem., W. Va.), who is conducting the hearings, announced that the Committee plans to suggest legislation to protect the public from labor monopolies in the same manner that the anti-trust laws function with regard to industrial monopoly. He said the need for the investigation was suggested by the report that a single individual would be authorized to speak for the coal industry in contract negotiations and that he, with a single representative of labor in the industry, could determine not only wage but also production levels.

First to testify at the invitation of the Committee were George Love, president, Pittsburgh Consolidation Coal Co. and Harry Moses, president, H. C. Frick Coke Co. Both denied reports that any attempt is being made to appoint a "czar" in the bituminous coal industry, but stated that there had been discussion of a spokesman to carry on negotiations with the UMWA. Speaking of the current three-day work-week, Love charged that it is retarding the efficient progress of the coal industry in its competition with other forms of energy. He emphasized that this limitation of the use of costly equipment and plants "is a confiscation of a large part of the capital invested in these facilities which progressive operators see as a necessary means to reduce the cost of coal to the consumer."

Criticizing the arbitrary action of the UMWA, Moses said that his conception of the wage agreement did not accept the theory that a labor union be empowered to arbitrarily shut off production when it believed a period of overproduction to exist.

Appearing for the National Coal Association, vice-president John Battle declared that Congress had never intended unions to be placed in the position of being able to restrict production simply because of immunity granted under the anti-trust laws. He explained that any such action by management is strictly prohibited and that if unions are permitted to do it then we shall live and function at the discretion of the labor unions and no equality under the law will exist.

Thurman Arnold, formerly head of the Anti-Trust Division, Department of Justice, declared that, "It is a very dangerous thing to subject unions to no curbs whatever." Arnold emphasized that the illegitimate objectives of unions should be specifically declared unlawful, including: strikes to prevent outside goods from coming into a territory; exclusion of efficient methods; refusal to allow independent firms to remain in business; activities which maintain artificial prices or restrict production; and any "make-work" system.

Rolla Campbell, general counsel, Island Creek Coal Co., charged that the UMWA does exist as a monopoly, that its miners are a well-disciplined army and that the effect of this monopoly is to restrict output and increase the cost of production of coal. Campbell declared that Congress is to blame for the present actions of labor unions and their officials. He named the Clayton Act, Norris-LaGuardia Act, NRA, Guffey Act, Wagner Act, and the shortcomings of the Taft-Hartley Act as contributing causes to the complete monopolistic control by unions of the labor supply in various industries.

Joseph E. Moody, president, Southern Coal Producers Association, protested the three-day week and called for application of the anti-trust laws to unions.

Testifying for the Southern States Industrial Council, Tyre Taylor expressed surprise that while many Administration and Congressional sources have been calling for heavy increases in the production of commodities, there have been no protests from these sources over the UMWA restrictive three-day work-week. He called attention to this as a further evidence of how far this country has moved toward the double standard which exempts labor leaders from the rules of economic conduct that apply to the managements of business enterprise. Taylor asked amendment of the anti-trust laws and of the Taft-Hartley Act to include the railroads and require the bargaining units in the coal, steel producing, and rail transportation industries to be on a company-wide basis, with all other bargaining units restricted to a metropolitan district, county, or a company-wide basis.

Coal Negotiations

Contract negotiations between the UMWA and Northern and Western coal operators are again recessed until August 11, following the July 27 meeting at White Sulphur Springs, W. Va. The operators offered to extend current coal wage contracts until March 21, 1951, but this was rejected by the miners. The Southern Wage Conference met at Bluefield, W. Va., July 26, but recessed almost immediately until August 10.

It is very apparent that the Mine Workers' leadership is waiting for the three-day work-week to cut down the volume of coal in storage in the hope that this will turn the tide of bargaining to their advantage.

Coal Mine Inspection

The Neely (Dem., W. Va.) bill, S. 1031, which would grant police powers to Federal coal mine inspectors, has been reported by the Senate Committee on Labor and Public Welfare and is now subject to the action of the Senate. A companion bill, H. R. 3023, by Rep. Price (Dem., Ill.) has been reported by a House Labor subcommittee to the full Committee on Labor and Public Welfare.

Both bills have been amended to provide a fine of $500, or 60 days' imprisonment, or both, for willful failure or refusal by a coal mine official to furnish information on accidents to the U. S. Bureau of Mines. In their present version they direct the Secretary of Interior, acting through the Bureau of Mines, to promulgate regulations deemed necessary to establish safety standards and requirements to be observed in the operation of coal mines.

Such regulations would prescribe—(1) minimum standards governing timbering, support, and prevention of collapse or squeeze in coal mines as may be required in the interest of safety; (2) governing construction and use of machinery and equipment, and composition and use of explosives; (3) governing methods of mining, ventilation, prevention of gas or dust explosions, and transportation in coal mines; (4) governing operations, equipment, ventilation, and methods of mining as may be required in the interest of health; (5) rules and regulations and minimum standards, in the interest of health and safety, governing inspections of and repairs to coal mines, coal-mining equipment and machinery, and inspections of coal-mining methods and procedure; and (6) rules and regulations to effectuate the purposes of the Act.

Incentive Payments

Latest move in the effort to secure financial aid to encourage mining is the assignment of the O'Mahoney bill, S. 2105, discussed in the July issue, to a Senate Public Lands subcommittee. Senator O'Mahoney is chairman of this subcommittee but it is difficult at this time to foresee what action will be taken.

Another bill has been introduced by Senator Pat McCarran of Nevada, with 18 Senators as co-sponsors, which would make an amount equivalent to tariff receipts from metal imports available to producers of tungsten, mercury, antimony and manganese. No action has been taken on this bill pending a report from the Department of Interior to the Committee on Interior and Insular Affairs.

A new bill by Rep. Clair Engle of California, H. R. 5725, which has been reported by the Committee on

(*Continued on page 65*)

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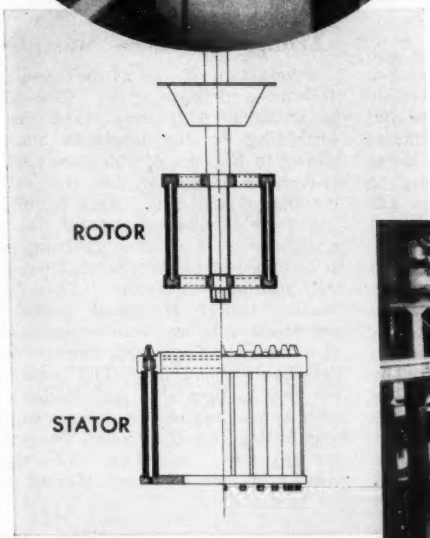

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High Extraction Under Tender Top

Hand Loading on Conveyors to Recover Pillars in a Thick Seam

By JAMES BRENNAN
Manager
Imperial Coal Co.

IN Weld County, Colo., three miles east of Erie, lies the Imperial mine. The mine is serviced by the Washington Road, Colorado 185, which is one-half mile to the east. This road gives easy access to the property from the surrounding communities and Denver. The mine is also served by the Union Pacific Railroad. Approximately 20 percent of the coal produced is trucked to the neighboring towns, including Denver.

Imperial, a shaft mine 289 ft deep, was put into operation in the fall of 1926 by the Imperial Coal Co. The coal of this area, which is part of the northern coal field of Colorado, located in the plains area east of the Rocky Mountain range, is an excellent grade of lignite, assaying approximately 9900 Btu and 22 percent moisture. The coal seam has a slight 1½ percent pitch to the northeast and is of an average thickness of 9 ft. It is free from impurities. The coal is topped by 5-12 ft of black slate and has a soapstone bottom.

In general the roof is extremely tender. The slate top is thinly laminated and swells badly when exposed to air. This necessitates leaving 12-14 in. of top coal in place, to protect the roof from absorbing moisture from the air.

With a great demand for lump coal to be used for domestic heating purposes, the mines of this area have a steady winter run. The five summer months demand is for industrial size coal and this demand is quite small. During the summer months the mines carry on general underground maintenance of haulageways and do the development work which will be needed for the following winter season's run.

During the winter months the Imperial mine employs an average of 78 men underground and 10 on the surface. The mine operates two shifts a day with an average tonnage of 900 tons of clean coal. The underground equipment in this mechanized mine consists of 14 shaking conveyors, 16 shortwall cutting machines, 11 trolley locomotives, 2 battery locomotives, and 1½-ton steel and wood mine cars equipped with roller bearings. Hand-held electric drills are used exclusively.

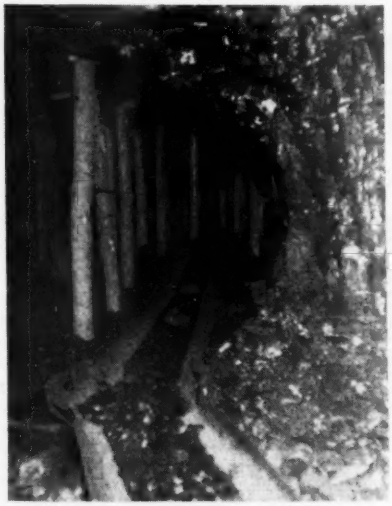
One small section of the mine is hand worked by ten men. This section of the mine is so small and isolated from the other work that it was found impractical to mechanize the loading.

Production Plan Gives High Recovery

The mining system is room and pillar with 92 percent extraction. The room entry development is laid out to conform to the slips in the coal seam; thus the main north entries run approximately N 5 deg E. Room entries are turned off at 90 deg to the main north entries. Rooms are turned to the north on 30-ft centers, 18 ft wide, thus leaving a 12-ft pillar. Due to the relatively heavy cover and the tenderness of the whole top, it has been determined by experimentation that a room depth of 200 ft is maximum. When this room depth is adhered to, the room can usually be driven out to its full depth and the adjacent pillar extracted without the necessity of any appreciable amount of retimbering in the room area. The additional time required to drive deeper rooms results in a considerable expense for retimbering the room as 8-in. pine posts will crush out in from three to four weeks under the dead weight of this shale top.

Trough Reduces Shoveling

Production of coal at the room face follows a definite cycle. The seam is undercut 6 ft deep, then drilled according to the standard pattern shown in Fig. 3. A wide-face loading trough is employed for the actual loading of the coal. This trough is 4½ ft wide and practically flat for a distance of 5 ft from its front end. It is clamped to the trough line with two standard C clamps. This face-loading trough is placed under the cut about 3 ft and one or two shots at a time are fired with Cardox, with the shaker operating. The center of the face is first shot and loaded out with approximately 50 percent of the coal falling into the trough line without any hand shovelling. The right side of the place is then blasted and



Elbows in conveyor line provide flexibility

Conveyor setup in an entry

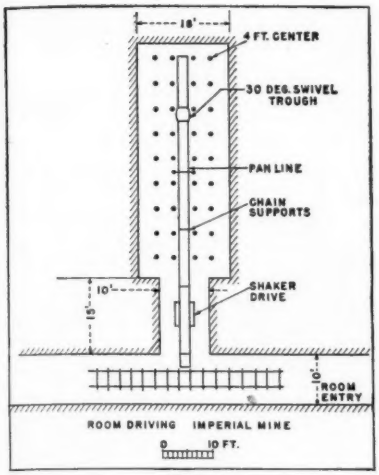


Fig. 1

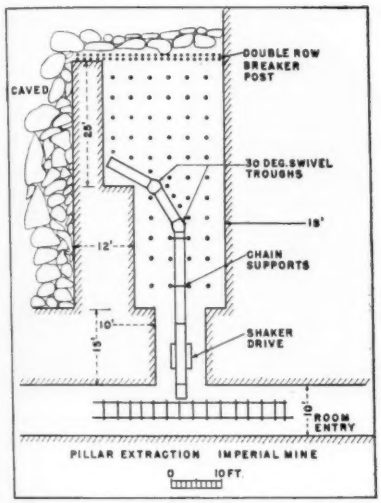


Fig. 2

loaded out in a like manner, followed by a similar procedure for the left side. Because of the 8-ft height of coal mined and the narrow 18-ft wide place, well over 60 percent of the coal is loaded out without handling by hand shovel.

Room timbering is conducted as shown in Fig. 1 and consists of four posts across the room at 4-ft centers and sufficient posting at the face to insure safe working conditions. Standard timbering on 4-ft centers is kept right up to the working face at all times. Props are never more than 4 ft from the face. Props are removed one at a time to allow for swing of the trough line and immediately re-set on the opposite side of the trough line. Since crossbars with two legs will not hold the dead weight of this roof, this posting and re-setting of timber is the only safe timbering practice that has been developed.

The 12-ft pillar is extracted by taking it back in 25-ft lifts. A double row of breaker props are placed to control the top for proper caving. This is shown in Fig. 2. On pillar work the same crew of four mc take out one cut per day. This lessened tonnage is due to the necessity of closer timbering in the pillar area. The rooms are driven without crosscuts, using auxiliary blower fans for ventilation.

The standard shooting practice in rooms consists of seven holes as shown in Fig. 3. To produce lump coal for the domestic market, Cardox is the shooting medium. When industrial. small size, coal is needed, the coal is shot down with three sticks of permissible powder per hole.

The top caves quite readily with the removal of the breaker posts and room timbering, thus giving good roof control and keeping the weight off the pillars. The timber recovery runs from 50-90 percent.

Electric power is supplied to the mine by the Public Service Co. of Colorado at 13,000 v, 3-phase, 60 cycle. The incoming power is transformed on the surface to 440 v. Cutting machines and shaker drives operate on the 440-v, a-c current. Each cutting machine is equipped with an internally-mounted transformer with an outside receptacle to provide 110 v to operate the hand-held electric drills. The 250 v, d-c power used for the trolley locomotives is obtained from a motor generator set on the surface. The hoist is operated by a reciprocating steam engine.

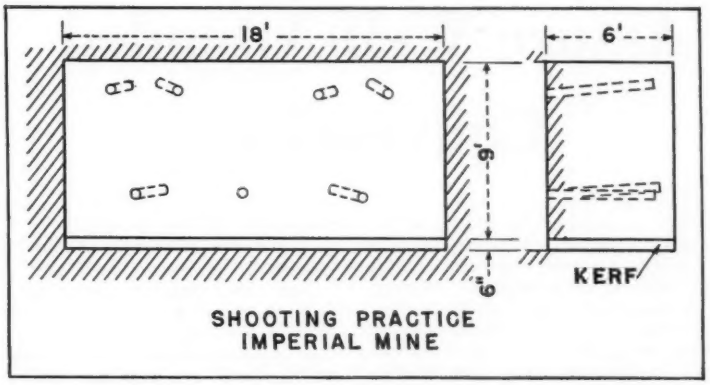
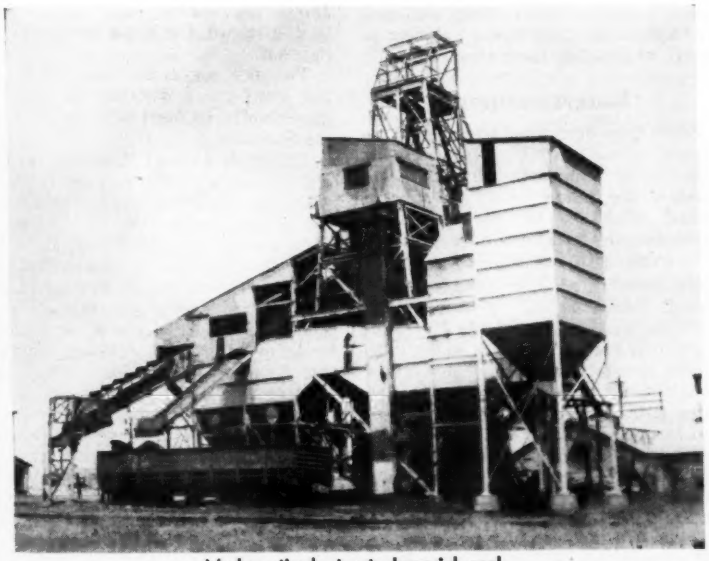


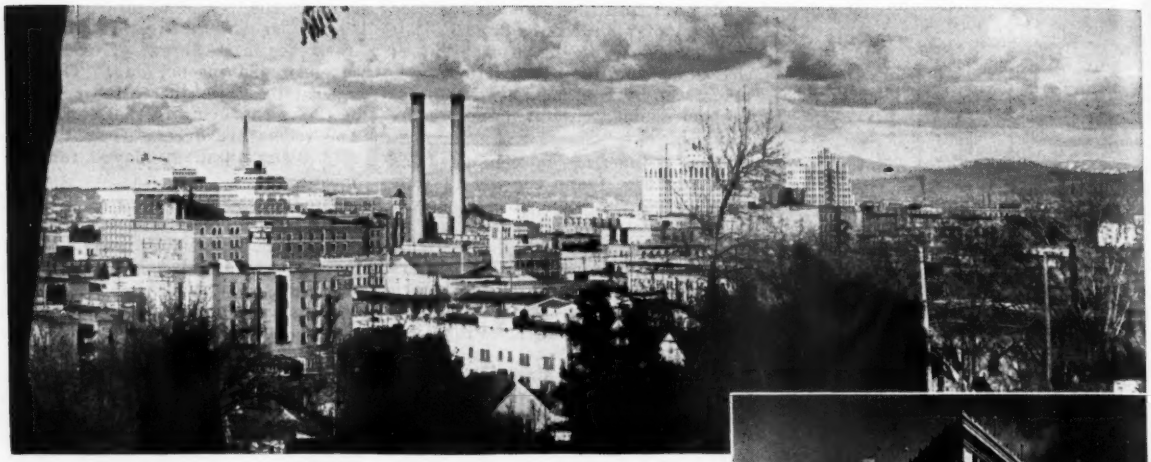
Fig. 3

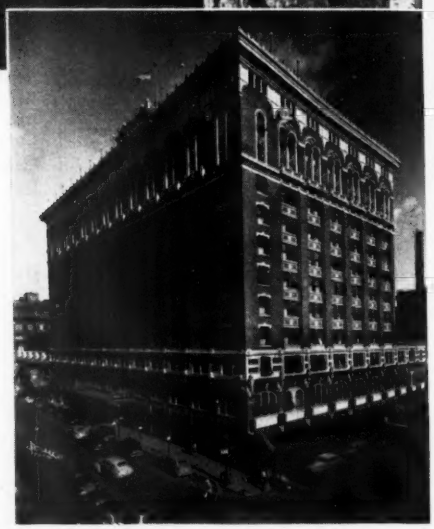
0—¾ in.—dust
0—1½ in.—1½ slack
0—2½ in.—2½ slack
¾—1½ in.—modified pea—stoker
1½—2½ in.—pea
2½—8 in.—egg or nut
8 in.+—lump.

Coal is hoisted to the tipple in the mine cars and dumped into a weigh hopper. After weighing, the coal is screened and sized into the grades as shown in above table.



Modern tipple treats Imperial coal





Spokane—heart of the Inland Empire—and its Davenport Hotel, headquarters for the 1949 Convention

Spokane Plans Assure Well-Attended Convention

WHEN mining men from all over the United States and Western Canada convene in Spokane, September 26-28, they will critically examine the present status of the mining industry and set a course for the active year ahead. Every phase of the many ramifications of the business, management, and operating ends of mining will be subjected to constructive study. Advance registrations at this outstanding assembly of the mining year indicate that some 1500 to 2000 men will participate.

An industry-wide committee has completed an excellent program which will bring to Spokane top-flight engineers, economists, business leaders, mine operators, and government officials. The best thinking on topics of vital importance to mining will analyze the present and the past and indicate the forward path that the industry should follow to fulfill its objective of supplying the Nation's required metals and minerals in the most efficient and economic manner.

Five general sessions are scheduled on the extensive program. Related topics have been grouped together, so far as possible, with sessions on the general business outlook; prospects for metals and nonmetallics; labor-management questions; the Communist threat; taxes, exploration and production incentives, stockpiling, and tariffs; problems of the small mine operators; and public land policies and finding mines of the future.

The four special operating sessions, devoted to mining and milling practices, include papers on progress in ore-dressing methods;open-pit drilling and ore-haulage; belt conveyors and Diesel-powered equipment underground; rock drill bits; sinking inclined shafts; roof bolting; and dust problems and other topics relating to health and safety in mining.

Entertainment

Some fine occasions have been arranged in recognition of the need for stimulating entertainment, both to balance the hours spent in concentrated attention to the industry's problems, and to afford an opportunity to meet with friends.

On Monday an interest-packed informal luncheon will be had at the National Guard Armory, handy to all downtown hotels, where a nationally-known speaker will give a message of wide interest to mining men. Monday night will be highlighted by the Mining Jamboree at Spokane's Natatorium Park. Appropriate refreshments and an appetizing box lunch, supplemented by hot food, will be served amid the tall pines. A talented performance by headline entertainers will precede several hours of dancing on the spacious floor of the Natatorium ballroom. The facilities of this famed amusement park will be open to the crowd for some laugh-provoking fun.

Tuesday night has been left open for Convention visitors to have an opportunity to meet with friends and see Spokane.

The 1949 Annual Banquet, gala social occasion of the mining industry, will take place Wednesday evening in the impressive setting of the Davenport Hotel. All facilities, including the beautiful lobby and mezzanine, have been made available for this feature affair. Stellar entertainment by Northwestern talent will be followed by an evening of enjoyable dancing in two ballrooms—one for modern and one for "old-time" dances.

A cordial invitation is extended to the ladies to attend all Convention sessions, as well as the entertainment features. Also, several special occasions have been arranged for the ladies. On Monday afternoon they will be guests of Mrs. Robert P. Porter at her beautiful home in Spo-

Preliminary Program

MONDAY, SEPTEMBER 26

MORNING—FIRST GENERAL SESSION

Prospects for the Nonferrous Metals
Status of the Strategic Minerals
A Free Market for Gold
The Future of Silver

NOON—WELCOMING LUNCHEON

AFTERNOON—SECOND GENERAL SESSION

Labor-Management Relations
Fighting the Communist Menace
Mining Legislation in the 81st Congress

AFTERNOON—FIRST OPERATING SESSION

A Perspective of Milling Operations
Improved Flotation Results from New Balmat Crushing Plant
Sink-Float Plant at the Sullivan Concentrator

EVENING—MINING JAMBOREE

TUESDAY, SEPTEMBER 27

MORNING—THIRD GENERAL SESSION

Tax Treatment of New Mining Ventures and Producing Mines—including discussion of Canadian system
Exploration and Production Incentives
Stockpiling
Tariffs and Trade Agreements

MORNING—SECOND OPERATING SESSION

Diesel Engines for Auxiliary Power on Electric Locomotives
Conveyor Belt Transportation
Large Diameter Churn Drills

AFTERNOON—FOURTH GENERAL SESSION

Problems of the Small Mine Operator—Mechanization, Labor, Engineering, Accounting, Financing, etc. A full symposium on the problems of this important branch of the mining industry

AFTERNOON—THIRD OPERATING SESSION

Diesel Power Underground
Sinking Bunker Hill & Sullivan's Inclined Shaft
Symposium on Insert Bits
Symposium on Single-Pass Bits

WEDNESDAY, SEPTEMBER 28

MORNING—FIFTH GENERAL SESSION

Public Land Policies
How Mines of the Future Will Be Found
Final Report of the Resolutions Committee

MORNING—FOURTH OPERATING SESSION

Handling the Underground Dust Problem
Mine Safety Progress
Nonmetallic Mining in the Northwest
Roof Bolting

AFTERNOON

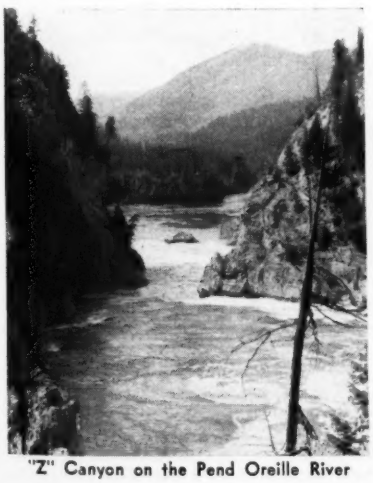
Informal Meetings of Tax Committee, Strategic Minerals Committee, Gold Producers Committee, etc.

EVENING—ANNUAL BANQUET

kane. Following "Brunch" on Tuesday, the ladies will be treated to an exclusive showing of the latest fashions.

Trips

This first meeting of the American Mining Congress to be held in the Northwest since 1929 offers an exceptional opportunity to see and enjoy many of the region's unique attractions, including some of the world's major mining and metallurgical operations. Seven trips have been planned.



"Z" Canyon on the Pend Oreille River

On Thursday, September 29, Trip No. 1 will take visitors to see the Bunker Hill & Sullivan mine or mill, the Page surface plant, and operations in the nearby Pine Creek area. Trip No. 2, September 30, will cover Wallace, Burke, and the Silver Belt to see the Hecla-Star mill, either the Dayrock or the Morning surface plant, and that of the Sunshine Mining Co.

Grand Coulee Dam will be seen on Trip No. 3 on September 29 and visitors will have a chance to make a complete inspection of the huge structure and associated facilities.

In another trip on Friday, a group will leave Spokane by bus to see the new Reeves MacDonald mill, termed the "newest and most modern mill in North America." In the afternoon, returning from British Columbia to Metaline Falls, trippers will visit the existing plant and new construction of the Pend Oreille Mines and Metals Co.

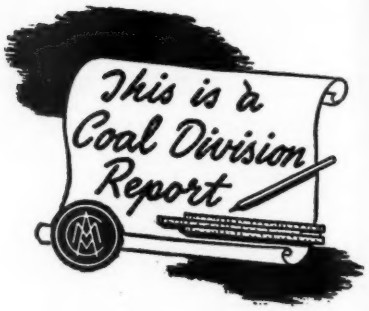
A visit is scheduled for Wednesday afternoon, September 28, on Trip No. 5, to light metals plants and a ferrochrome plant in the vicinity of Spokane. Tentative arrangements have been made for an airplane trip (No. 6) on Thursday, September 29, to give a bird's-eye view of the Inland Empire, covering the Coeur d'Alene district, Metaline Falls, Trail, Holden and the operations of the Howe Sound Co., Grand Coulee Dam and its irrigation projects, and back to Spokane.

The Consolidated Mining and Smelting Co. at Trail will be glad to welcome visitors at any time. If a sufficient number are interested, Trip No. 7, Thursday, September 29, will go to Trail by plane. After seeing the largest nonferrous metal reduction works in the world, visitors will return to Spokane by plane.

Those who plan to take in one or more of these trips are requested to place their reservations immediately. This will avoid disappointment as well as make it possible for the Trips Committee to proceed with detailed arrangements.

Splendid cooperation has been extended by mining people all over the country to assure the industry a worthwhile and enjoyable Convention. Those who attend will gather a wealth of valuable data on sound mining policy and the latest operating practices. Yours is the opportunity to meet in Spokane with your fellow mining men to build another milestone of progressive achievement in mining.

Combination Rail and Belt Haulage



A Joint Report of the Conveyor and Haulageroads Committees Covering a Mine with Track for the Main Line and Belts for Intermediate and Gathering Service

THE change from hand to mechanical mining brought corresponding changes in underground haulage. Large tonnages of coal produced in relatively small areas forced new methods and equipment for gathering; belts having proved their efficiency for this service have had their scope extended and are now used for intermediate, and in some cases, for main line haulage. The trend toward central preparation plants has greatly increased the length of main lines underground which in turn has necessitated larger mine cars, high speed locomotives, and railroad specifications for track construction.

Both track and belt have proven their ability to meet the requirements of modern mine transportation and are competitive in the usual seam heights and grades that are encountered in a majority of the coal mines in this country. Each type has certain advantages in cost and operation and is especially fitted for certain mining conditions but it is not the function or the intent of our Coal Division to attempt to say what these advantages are or where either class of equipment will give the best service. Some of the answers are matters of personal opinion, but in the final analysis, the efficiency of any machine or method is measured by its ultimate cost of installation, operation, and maintenance.

In order to show how these costs can be estimated, joint studies have been conducted by the Committee on Conveyor Mining and the Committee on Haulageroads and, in the past two years, several reports on mine cars and belt conveyors for main line and for gathering have been prepared and published.* A final study in this series is presented here, covering a mine using combination haulage—track for the main line and belt conveyors for intermediate and gathering service.

All of the estimates have been made on the following assumptions:

(a) The mine production is to be 1200 tons of coal per shift—1000 tons from the producing entries and 200 tons from the development. Working on two shifts and loading 2400 tons per day, the annual output for a year of 250 days would be 600,000 tons.

(b) A room panel is 2000 ft long, with a 200-ft barrier pillar. It is developed by three entries with rooms 300 ft long, driven to the right and left. See sketch below.

(c) An 80 percent coal recovery is assumed, making the following productions from a room panel: 103,680 tons from a 3-ft seam, 138,240 tons from a 4-ft seam, and 207,360 tons from a 6-ft seam.

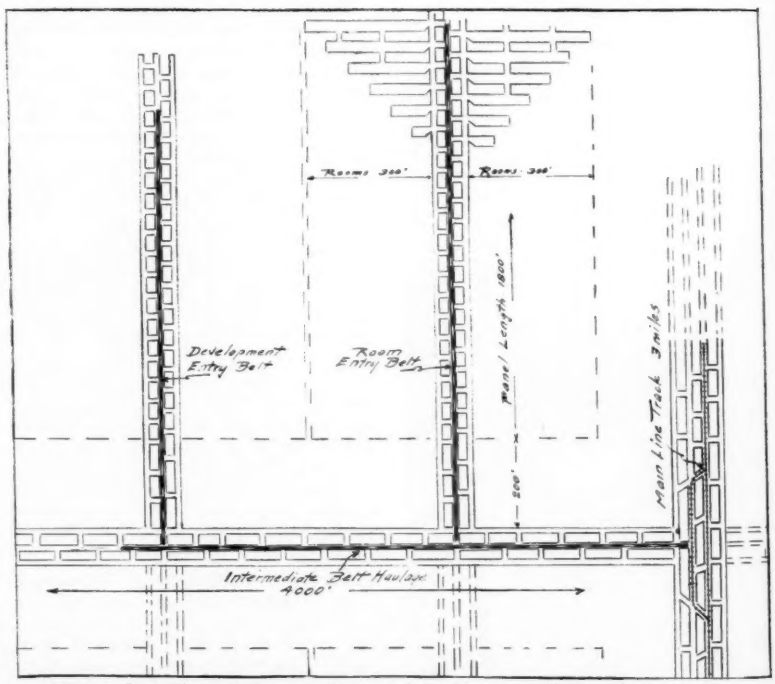
(d) Prices for material and equipment are to be as of March 1947.

(e) Equipment is to be depreciated at 10 percent, with interest at 3 percent. Investment costs per ton are based on an annual production of 600,000 tons.

(f) Annual costs of supplies and replacements are taken at 1 percent of the purchase cost of the equipment, except for belts, which are assumed to have a five-year life. The estimates presented in tables V, VI, and VII of this report show belt replacements as a part of the investment costs.

(g) Labor rate is $1 per man-hour.

(h) Electric power is 250 V dc furnished at 2c per kwhr; estimates cover haulage only, disregarding power for face operations.



Mining plan with track for main line and belts for intermediate and room entries

* Coal Mine Haulage—August 1947, MINING CONGRESS JOURNAL. Gathering Haulage with Belt Conveyors—January 1948, MINING CONGRESS JOURNAL. Gathering Haulage with Mine Cars—August and October 1948, MINING CONGRESS JOURNAL.

(i) Costs for conversion equipment or substations are not included here as this phase is being studied by the Power Committee who will later submit their report.

Transportation System

The accompanying sketch shows the mining plan on which the estimates are based and it will be understood that this drawing is diagrammatic rather than illustrating an actual mine projection. The main line, operated by track and mine cars, is estimated at three miles long. Inby from the main line, all haulage is to be by belt conveyors; the intermediate entries have a length of 4000 ft and the room entries are 2000 ft long. In view of the fact that belts can operate efficiently against moderate adverse grades, all workings, entries and rooms, are to be driven both to the right and left so that areas of maximum tonnage are developed adjacent to all haulages by belt and mine car.

Three seam heights are used; 6 ft, 4 ft, and 3 ft. The Conveyor Committee assumes that in 4-ft and 6-ft coal, a shift production of 1200 tons can be produced from one entry with rooms worked simultaneously off both sides, plus one set of development entries as illustrated in the sketch. A 3-ft seam, however, would require two room entries, plus the development entry. Equipment for these productions is figured accordingly in the estimates. The report does not include haulage from the face to the room neck as the transportation system described would serve any standard method that might be used in bringing coal from the face to the entry, whether by conveyors or shuttle cars.

Roof Brushing

To the estimated costs for haulage installation and operation, there must be added an extra cost for roof or bottom brushing in low coal. The reports therefore include this item for both classes of equipment in the 3-ft seams, but with one difference; for track haulage, an entry must be brushed its entire width, while belt haulage requires only that a travelway be brushed alongside the conveyor. In a 4-ft seam, track would require some brushing to provide sufficient height above the rail. For belts the natural height of 4 ft is considered adequate for a walkway.

Track Haulage Brushing

Estimates for the main line are based on taking two feet of top in a 4-ft seam and three feet in a 3-ft seam at costs of $7.00 and $10.00 per lineal yard, respectively. It is the Committee's opinion that this charge should be spread over a 20-year period, and that the cost per ton would be calculated as follows:

In a 4-ft seam, the main line length of 5280 yd (3 miles), would have an added 1200 yd of sidetrack for six panels, developed during the 20-year life, making a total of 6480 lineal yards of entry brushing. At $7.00 per yard, the cost would be $45,360 and a 20-year production of 12,000,000 tons would mean a brushing cost of $.0038 per ton. In a 3-ft seam there would be 1600 yd of sidetrack added for eight panels, to make a total of 6880 lineal yards of main line entry brushing. At $10.00 per yard, the cost would be $68,800 and a 20-year production of 12,000,000 tons gives a brushing cost of $.0057 per ton.

Belt Haulage Brushing

As stated above, no brushing is considered necessary on a 4-ft seam, but where a 4-ft height is required for a travelway along belt conveyors, a charge for such brushing must be added to the costs for the 3-ft seam. The Committee estimates that this

Table I—ESTIMATED COST OF MATERIALS FOR TRACK AND WIRING

For a Main Haulage Three Miles Long

	Unit Cost	Units	Total Cost	
60 lb rails—tons	$ 67.87	370	$25,111.90	
Angle bars—pairs	2.00	325	650.00	
Treated ties	1.50	9,150	13,725.00	
Untreated ties	.79	2,800	2,212.00	
Spikes—kegs	8.50	90	76.50	
Track bolts—kegs	14.43	5	72.15	
Rail bonds—4/0	2.20	325	715.00	
Slag ballast—tons	1.75	2,640	4,620.00	
Welding—joints	3.76	1,056	3,970.56	
Turnouts	177.26	18	3,190.68	
Switch tie sets	44.16	18	794.88	
Cross bonds—4/0	2.24	22	49.28	
				$55,187.95
Trolley wire—lb	$ .31	26,000	$ 8,070.00	
Feeder line—lb	.31	24,600	7,626.00	
Dual clamps	1.48	420	621.60	
Single clamps	.59	270	159.30	
Mine hangers	.68	900	612.00	
Expansion bolts	.41	900	369.00	
Feeder splicers	4.37	10	43.70	
Trolley splicers	2.11	18	37.89	
Section switches	20.33	4	81.32	
				17,620.81
Total Cost of Track and Wire Material				**$72,808.76**

INVESTMENT COST

Depreciation @ 10%	$ 7,281
Interest @ 3%	2,184
Supplies @ 1%	628
Total Annual Charge	$10,093
Cost Per Ton (600,000 Tons)	**.0168**

Table II—ESTIMATED LABOR COST FOR INSTALLING AND REMOVING TRACK & WIRE

	Unit Cost	Units	Total Cost
Welder track	$ 3.00	15,840	$47,520.00
Bolted track	2.77	6,265	17,354.05
Turnouts	147.50	48	7,080.00
Trolley	.177	15,840	2,803.68
Feeder	.177	15,840	2,803.68
Sidetrack trolley	.177	6,265	1,108.90
Total Cost			$78,670.31
Cost per ton (ten years' production of 6,000,000 tons)			**$ .0131**

TABLE III—ESTIMATED COST OF TRACK HAULAGE EQUIPMENT

Mine cars—40 @ $1,000	$40,000
Locomotive—10 ton	12,600
Locomotive—15 ton	16,200
Total Investment	$68,800
Depreciation @ 10%	6,880
Interest @ 3%	2,064
Supplies @ 1%	688
Charges per year	$ 9,632
Cost per ton (600,000 tons)	**$ .0161**

TABLE IV—LABOR FOR TRACK HAULAGE

Mainline motormen—2 men	$16
Mainline triprider—2 men	16
Gathering motormen—1 man	8
Equipment maintenance—1 man	8
Track-wire maintenance—1 man	8
Total Daily Cost	$56
Cost Per Ton (2400 Tons)	**$.0233**

TABLE V—INTERMEDIATE BELT HAULAGE

ESTIMATED EQUIPMENT COST

Belt Conveyor: 4000 ft	
2 Terminals—40 hp	$ 15,000
2955-ft frame & idlers	31,125
8030-ft, 30-in. belt }	
8030-ft, 30-in. belt }	87,688
	$133,814
Supply Handling Equipment	
Rubber-tired tractors or Locomotives	$ 32,000
Feeder Wire—Haulage Only	
8000 ft—500,000 CM	$3,952
200 hangers @ $1.00	200
200 plugs @ 10c	20
200 clamps @ 50c	100
	$4,272
Total Investment	$133,814.00
	32,000.00
	4,272.64
	$170,086.64
Depreciation @ 10%	$ 17,008.66
Interest @ 3%	5,102.60
Supplies @ 1%	823.99
Annual Charge	$ 22,935.25
Cost Per Ton (600,000 Tons)	**$.0382**

ESTIMATED POWER COST

65 hp per day of 16 hr

$$\frac{65\times16\times746}{75\%} = 1040 \text{ kwhr}$$

1040 kwhr @ .02 = $20.80 per day

Cost Per Ton (2400 tons) ..... **$.0086**

ESTIMATED LABOR COST

Installing and Removing Equipment

6-ft seam—1000 man-hour	$1,000
Cost per ton (3,072,000)	$.0003
4-ft seam—1400 man-hour	$1,400
Cost per ton (2,048,000)	$.0007
3-ft seam—2000 man-hour	$2,000
Cost per ton (1,536,000)	$.0013

Daily Labor—All Seam Heights

1 maintenance man	$8.00
2 supply men	16.00
2 loading boom men	16.00
Total daily labor	$40.00
Cost per ton (2400 tons)	$.0167

TABLE VI—ROOM ENTRY HAULAGE FOR 6-FT AND 4-FT SEAMS

ESTIMATED EQUIPMENT COST

Room Entry—2000 ft	
Terminal and drive	$6,728
Frame and idlers	14,972
4000-ft, 30-in. belt }	
4000-ft, 30-in. belt }	46,5)
Development—1000 ft	
Terminal and drive	$6,728
Frame and idlers	7,486
2000-ft, 30-in. belt }	
2000-ft, 30-in belt }	23,270
Total Investment	$105,724
Depreciation @ 10%	$10,572.40
Interest @ 3%	3,171.72
Supplies @ 1%	359.14
Annual Charge	$14,103.26
Cost per ton (600,000 tons)	**$.0235**

ESTIMATED POWER COST

39 hp per day of 16 hr

$$\frac{39\times16\times746}{75\%} = 624 \text{ kwhr}$$

624 kwhr @ .02=$12.48 per day

Cost per ton (2400 tons) ..... **$.0052**

LABOR COST FOR A 6-FT SEAM

Installing and Removing Belt
Man-hour—500 @ $500
Cost per ton (207,360) ..... **$.0024**

Daily Labor

2 maintenance men	$16.00
2 loading boom men	16.00
Total daily labor	$32.00
Cost per ton (2400 tons)	**$.0133**
Total labor cost per ton	**$.0157**

LABOR COST FOR A 4-FT SEAM

Installing and Removing Belt
Man-hour—700 @ $700
Cost per ton (138,240) ..... **$.0051**

Daily Labor

2 maintenance men	$16.00
2 loading boom men	16.00
Total daily labor	$32.00
Cost per ton (2400 tons)	**$.0133**
Total labor cost per ton	**$.0184**

TABLE VII—ROOM ENTRY HAULAGE FOR A 3-FT SEAM

ESTIMATED EQUIPMENT COST

1st Room Entry—2000 ft	
Terminal and drive	$6,728
Frame and idlers	14,972
4000-ft, 30-in. belt }	
4000-ft, 30-in. belt }	46,540
2nd Room Entry—1000 ft	
Terminal and drive	$6,728
Frame and idlers	7,486
4000-ft, 30-in. belt	23,270
Development—1000 ft	
Terminal and drive	$6,728
Frame and idlers	7,486
2000-ft, 30-in. belt }	
2000-ft, 30-in. belt }	23,270
Total investment	$143,208
Depreciation @ 10%	$14,320.80
Interest @ 3%	4,296.24
Supplies @ 1%	501.28
Annual charge	$19,118.32
Cost per ton (600,000 tons)	**$.0319**

ESTIMATED POWER COST

52 hp per day of 16 hr

$$\frac{52\times16\times746}{75\%} = 832 \text{ kwhr}$$

832 kwhr @ .02=$16.64 per day

Cost per ton (2400 tons) ..... **$.0069**

ESTIMATED LABOR COST

Installing and Removing Belt
Man-hour—1000 @ $1,000
Cost per ton (103,680) ..... **$.0096**

Daily Labor

2 maintenance men	$16.00
3 loading boom men	24.00
Total daily labor	$40.00
Total labor cost per ton	**$.0263**

Intermediate conveyor loads into main line trip

can be done for $1 per lineal ft. The intermediate entry, 4000 ft long, would have a brushing cost of $4,000 which, divided by 1,635,000 tons of coal adjacent to this haulage, makes a brushing cost of $.0026 per ton. In a room entry 2000 ft long, the brushing cost would be $2,000 which, divided by 103,680 tons of coal mined from the panel makes a brushing cost of $.0193 per ton.

Supply System for Belt Haulage

When conveyors are operating in tandem, belt reversing is not recommended, due to the difficulty and cost of transferring the in-going supplies from one unit to another. For the intermediate entry, therefore, the Committee recommends some other system of handling supplies, either rubber-tired tractors or else a supply track paralleling the conveyor. It does not seem within the scope of this study to specify the type of supply equipment, since this will depend upon the class and amount of material handled as well as mining and general operating conditions. However, for the purpose of calling attention to the fact

TABLE VIII—SUMMARY OF COSTS PER TON

	6-ft Seam	4-ft Seam	3-ft Seam
Main Line Track			
Track and wiring	$.0168	$.0168	$.0168
Rolling stock	.0161	.0161	.0161
Labor—installation	.0131	.0131	.0131
operation	.0233	.0233	.0233
Power	.0075	.0075	.0075
Brushing	....	.0038	.0057
Cost Per Ton	$.0768	$.0806	$.0825
Intermediate Belt			
Equipment	$.0382	$.0382	$.0382
Labor—installation	.0003	.0007	.0013
operation	.0167	.0167	.0167
Power	.0086	.0086	.0086
Brushing	....	....	.0026
Cost Per Ton	$.0638	$.0642	$.0674
Room Belt			
Equipment	$.0235	$.0235	$.0319
Labor—installation	.0024	.0051	.0096
operation	.0133	.0133	.0167
Power	.0052	.0052	.0069
Brushing	....	....	.0193
Cost Per Ton	$.0444	$.0471	$.0844
Total Costs for Combination Haulage System			
Main line track (3 miles)	$.0768	$.0806	$.0825
Intermediate belts (4000 ft)	.0638	.0642	.0674
Room entry belts	.0444	.0471	.0844
Total Cost Per Ton	$.1850	$.1919	$.2343

that this item is considered to be an integral part of the intermediate belt haulage, the Committee has set an arbitrary figure of $32,000 in Table 5. For the room conveyors, it is believed that belt reversing will serve.

Conclusion

Both Committees wish to repeat the caution issued with former reports that the figures given here do not apply to any specific mine or operation—for example, the equipment prices are as of March 1947, and the labor costs are taken at $1.00 per hour. The purpose is to indicate what cost items must be considered when planning an underground transportation system and the Committees present this report in the hope that in this way it will serve as a valuable guide to the industry.

Submitted April 1949.

A. E. LONG,
Chairman, Conveyor Committee
C. C. HAGENBUCH,
Chairman, Haulageroads Committee
J. B. HASKELL
ROBERT FLETCHER
C. W. THOMPSON.

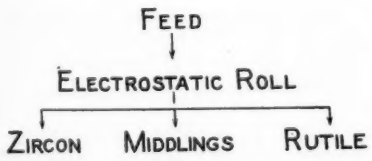
Electrostatic Separation

(*Continued from page 27*)

schematic and is increased to the desired capacities by simply adding rolls in series, parallel, or parallel-series.

Using a head feed containing approximately half rutile and half zircon, with this flow-sheet, a rutile whose zircon content is less than three percent and a zircon whose rutile content is less than 1/10 of one percent, can be produced. Head feeds of 500 lb per hour per foot of roll used can be attained.

Specification rutile can be produced at 150 lb per hour per foot of roll, and specification zircon can be produced at 50 lb per hour per foot of roll. These capacities may seem small, but there is always 100 percent recovery and the ratios of concentration are large.



Costs can vary widely, as it is largely a matter of how well the machinery and its appurtenances are arranged to be handled by a minimum of labor. It is not out of reason to say that one attendant can care for 16 to 20 well-arranged, single-roll machines.

One large economic factor in machine arrangement found in the separation of rutile and zircon is the choice of single versus multiple-roll arrangement. A multiple or roll stacking arrangement requires less floor space, but requires greater head room and more labor for operations.

Single-roll arrangement requires a large amount of floor space and elevating capacity, but without doubt gives a closer control of products, both at the individual roll and the final removal point.

When every roll is at the same level and the products therefrom are always in full view and under full control of the operator, most operators in the rutile-zircon industry have found they could increase unit capacity with the single roll in comparison to the multiple-roll arrangement.

With the advances in the mechanical structure of electrostatic machines, and the further perfections of the sources of static electricity, there is every reason to believe that the art of electrostatic separation will find a place in the tool kit of the present and future ore dresser.

Asbestos Mining

Approximately 70 percent of the world's supply of asbestos fibre comes from the serpentine belt of eastern Quebec. A total of 11 producing mines are expanding operations to meet the continuing strong demand for this important industrial mineral. New ore bodies have been found and are under development and milling facilities are being enlarged and improved.

Reserves are large, in some mines ample for 50 years or more. Potential reserves are considered quite extensive. The best spinning fibres come from the huge Thetford deposit which is worked by three companies. Medium length fibres are obtained from the Black Lake deposits. There, drilling is being carried out under the Lake where extensive asbestos-bearing formations have been found. It is proposed to drain the lake in order to work the deposits.

Open-pit mining accounts for the bulk of mine production, but the output of two mines is entirely from underground. Two additional underground mines are scheduled to begin production in 1951, using block-caving. Approximately 94 percent of the asbestos mined and milled in Canada is exported.

The Johns-Manville Corp. is planning development of a new mine near Larder Lake in Ontario. The site is location 70 miles southeast of Timmins, Ont., and 200 miles northeast of Sault Ste. Marie. It has been reported that the quality of the fiber at Larder Lake is superior to that at Asbestos. According to an official statement of the company, $10,000,000 originally slated to expand facilities of the firm's property at Asbestos, Que., has been diverted for use at Larder Lake. Some of the equipment from Asbestos will be moved to Larder Lake. Operations at Asbestos will not be discontinued but the expansion scheduled for that plant will merely be deferred.

James L. Hamilton has been elected vice-president in charge of operations for the Island Creek Coal Co., Pond Creek Pocahontas Co., and Marianna Smokeless Coal Co., effective August 15. Mr. Hamilton fills the vacancy created by the recent promotion of Raymond E. Salvati to president. Operating headquarters will be located at Holden, W. Va. For the past five years Mr. Hamilton has been manager of mines for Republic Steel Corp. He is president of the Coal Mining Institute of America.

Forbes B. Cronk, general mining engineer, Oliver Iron Mining Co., retired July 1 after 44 years of continuous service. During his outstanding career he participated in and headed a number of foreign surveys and explorations for iron ore and manganese in Brazil, Chile, Haiti, England, Sweden, Canada, and Venezuela. He will continue to serve the company in an advisory capacity. **J. F. Wolff,** assistant general mining engineer, was appointed to succeed Mr. Cronk and **Lloyd J. Severson** has been appointed assistant general mining engineer.

Samuel A. Crozer has been elected president of Crozer Coal & Land Co. and of the Page Coal & Coke Co., succeeding **Edward C. Page,** who has retired after 35 years of service with these companies. **Robert T. McCracken** was elected vice-president to succeed Mr. Crozer.

Thomas M. Ware has been appointed chief engineer of International Minerals & Chemical Corp. as of July 1. He succeeds **James H. Barr** who is retiring from active business after 38 years of service with the company. However, Mr. Barr will be retained by the company in a limited consulting capacity. Until his new appointment, Mr. Ware had been working as an industrial engineer on the engineering staff of the company.

The honorary degree of Doctor of Laws has been conferred on Dr. **Hugh Dinsmore Miser,** by the University of Arkansas. Dr. Miser is a staff scientist of the U. S. Geological Survey and a nationally known expert on petroleum geology.

Earl M. Klees, instructor in accident prevention, U. S. Bureau of Mines, has been conducting a series of classes for employes of West Virginia Coal and Coke Corp.

Arthur H. Bunker was elected president of the Climax Molybdenum Co. on June 27 and took office on July 1 after resigning as a general partner of Lehman Brothers. Mr. Bunker was the founder in 1923 and first president of the United States Vanadium Corp. From 1941-1945, he was identified with the Office of Production Management and the War Production Board. He became vice-chairman of the Metals and Minerals Office, organized in 1943, and was later deputy executive vice-chairman of the War Production Board and finally its chief of staff. At present he is a director of the American Metal Co., Ltd., the Firth Sterling Steel and Carbide Corp., and the Climax Molybdenum Co.

John G. Crawford, fuel engineer, Chicago, Burlington & Quincy Railroad, retired on June 30 as general manager and purchasing agent of the railroad's Valier Coal Co. He had been an officer of the company since 1925.

Roderick L. Syck, president of Thomsen Foundry Corp., has been named assistant vice-president and a member of the board of directors of the North Butte Mining Co.

Howard G. Schoenike, engineer with the M. A. Hanna Co., has been transferred from Crosby, Minn., to the firm's Iron River, Mich., operations.

John Welch, previously section foreman at Mine No. 7, Island Creek Coal Co., has been appointed mine foreman at the company's No. 16 mine. He succeeds **Lebert Parsley,** resigned.

Daniel A. Jones was recently appointed to the position of assayer and field engineer in charge of the laboratory and branch office of the Territorial Department of Mines at Nome, Alaska.

G. A. Franz, Jr., of Ouray, Colo., has been appointed Colorado Mine Inspector for District 4.

William A. M. Burden has been elected a director of the American Metal Company, Ltd., to fill the vacancy caused by the resignation of **Arthur D. Storke.**

L. W. Ingles, recently general superintendent of the Cribbs-Goodman Coal Co., has returned to the Colorado Fuel and Iron Corp., as superintendent of the Kebler and Pictou mines. He succeeds **J. L. McBrayer,** resigned.

Peter Colefax, president, American Potash & Chemical Corp., recently announced the appointment of **Russell W. Mumford** as vice-president in charge of technical operations.

Dr. **Morris M. Leighton,** chief, State Geological Survey, Urbana, Ill., has been elected president of the Society of Economic Geologists for the annual term 1950-51. Dr. Leighton will soon complete his 26th year as chief of the Illinois Survey, which under his administration has grown to be one of the foremost geological surveys in the United States.

John R. Drenan is now superintendent of the fluorspar division of the United States Coal and Coke Co., Mexico, Ky.

Robert C. Wallace has been appointed assistant superintendent for the Cooley district of Butler Brothers. He was formerly superintendent at the Argonne mine of the Hanna Coal and Ore Co.

R. C. Woodhead and **John Griffen,** coal preparation engineers on the staff of McNally-Pittsburg Mfg. Corp., are in Europe making an extensive inspection of coal cleaning plants. They will visit government and private coal preparation specialists in England, France, Belgium, and the Netherlands.

Why Not Say It?

WHAT is your reaction to the editorial content of Mining Congress Journal? Your comments, good or bad, will be helpful. We'd like to know what kind of a job we're doing in serving you as a reader, what articles or material are of most interest and value to you, and what suggestions you may have.

Your Editors will appreciate hearing from you. It will only take a minute to express yourself, and your views will be of real assistance in our future planning.

A. L. Lynn, vice-president, Island Creek Coal Co., succeeded James Francis as member of the U. S. Chamber of Commerce's Natural Resources Committee.

Other coal industry representatives named to serve on this important committee are **E. R. Keeler,** chairman, Franklin County Coal Corp.; **Robert P. Koenig,** president, Ayrshire Collieries, Inc.; **J. H. Oliver,** vice-president, Glen Alden Coal Co.; **James Prendergast,** vice-president, The M. A. Hanna Co.

Charles H. Behre, Jr., of Behre, Dolbear & Co., has returned from Rangoon where he has been discussing general plans for mineral development with the Burma Union government.

Robert D. Ellis has been named superintendent of mine No. 24 of the Island Creek Coal Co. succeeding **William Pritchard** who has been transferred to mines No. 25 and 26.

Walter E. Lewis is now associated with the U. S. Bureau of Mines offices at Minneapolis, Minn.

Walter O. Snelling, consulting chemist and director of research of the Trojan Powder Co., Allentown, Pa., has been appointed to the Atomic Energy Commission Advisory Committee on Raw Materials.

Herbert B. Jeffrey, executive department chief co-ordinator, Great Lakes Steel Corp., has been appointed assistant to the president.

Myron T. Herreid has been appointed successor to W. Reed Morris, retired, and is now vice-president and general manager of the Gas and Coke Division of Koppers Co., Inc.

W. Howard Winn has been promoted from smelter engineer to assistant smelter superintendent at the Hurley, N. M., plant of the Kennecott Copper Corp.

Z. M. Flaler, formerly service director and city engineer for Coldwater, Ohio, has been appointed chief of the Division of Reclamation created by Ohio State's new strip mine control measure.

Oglebay, Norton and Co. announces that **Harrie S. Taylor,** former vice-president in charge of mining operations, has been made president, succeeding **Crispin Oglebay.** Mr. Oglebay, president since 1925, becomes chairman of the board. **E. W. Sloan, Jr.** has been appointed treasurer, succeeding **Robert C. Norton.** Mr. Norton is now vice chairman.

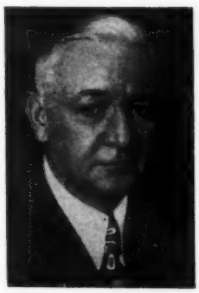
W. L. Anderson is now general superintendent for the Vanadium Corp. of America, Durango, Colo.

Donald M. Davidson has been elected vice-president of the E. J. Longyear Co., diamond drill contractors and manufacturers.

Dr. D. L. Masson, acting director of the mining division of Washington State College at Pullman, Wash., recently announced that the American Smelting & Refining Co. has set up two scholarships for outstanding students.

—*Obituaries*—

Edward J. Burnell, 62, vice-president, and general sales manager and director of Link-Belt Co., died July 22, after an illness of several months. Mr. Burnell came to this country from Wales and lived for a time at Catasauqua, Pa., where he was buried. He was graduated from Lehigh University in 1910.



Mr. Burnell was widely known and respected throughout the entire coal mining industry and in all operations using material handling equipment. He was a director of the American Mining Congress where he ably served in formulating sound, progressive policy for the industry. He was also a director of Drexel State Bank of Chicago, Foundry Equipment Manufacturers Association, the Conveyor Equipment Manufacturers Association, and the YMCA of Hyde Park, Ill.

During the war years he served on the advisory boards of the Machinery Branch of the WPB and the Chemical Corps of the War Department, and as consultant to the RFC.

His passing leaves a vacancy in the hearts of his friends that will not be filled easily.

H. M. Ross, 88, former mine operator in Idaho and Montana, died July 14 in Seattle. Mr. Ross was the president of the Sydney Mining Co., Kellogg, Idaho, for many years.

W. B. Prescott, vice-president, Goodman Coal Corp., who was widely known in the operating and selling ends of the coal mining industry, passed away recently.

William D. Mark, 44, mining engineer for the Reconstruction Finance Corp., died June 16 in Chevy Chase, Md. After graduation from the Idaho School of Mines, Mr. Mark joined the geological department of the Anaconda Copper Mining Co. and in 1933 went to South America with Cerro de Pasco Copper Co. For the past 13 years he has been with the Washington office of the RFC after several years of service as a field representative in the Western States.

Elias A. Cappelen Smith, well-known metallurgical engineer, died in June. He had been a partner in the firm of Guggenheim Brothers for many years and was the inventor of several scientific processes which contributed towards the commercial development of selenium, tellurium, platinum, and palladium.

Alexander C. Stewart, 75, recently died in Seattle after a long illness. A well-known Northwest mining engineer, he participated in the Alaskan gold rush in 1900 and since then he has returned to Nome each summer to operate his own company. He was a past president of the Northwest Mining Association.

Addison H. McKay, 83, a leader in the development of iron and titanium deposits, as well as oil and gold in both North and South America and in foreign countries, died recently in Montreal.

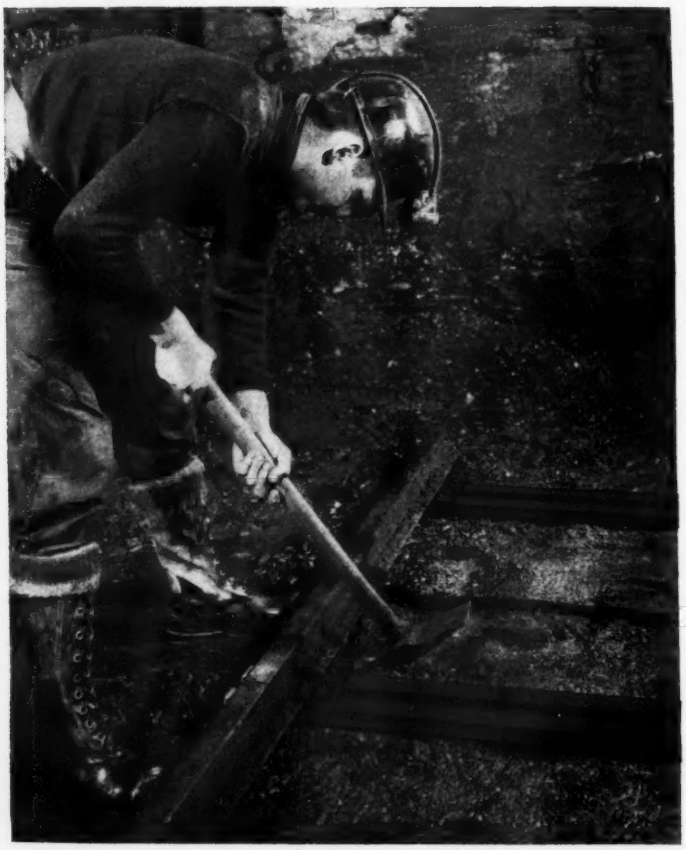
W. A. Bishop, 76, who had been chief engineer for 20 years and an employe of the Pocahontas Fuel Co., Inc., for nearly 50 years, died recently. He was widely known in the coal mining industry.

W. P. (Billy) Mullen died in McAlester, Okla., at the age of 76. Mr. Mullen was a veteran coal operator in southeastern Oklahoma for over 40 years.

FOR HEAVY TRAFFIC

BETHLEHEM NO. 5 STEEL TIE

No. 5's being installed near the working face. Note the breadth and depth of these ties.



Heavy is what we mean . . . in the strictly literal sense. Loads that weigh a lot of tons. It's for this kind of traffic that Bethlehem's No. 5 is built and sold.

Today's mechanized equipment puts unusual burdens on the track structure. But the No. 5 steel tie is meant for these loads, and it will stand up for long periods, even when bottom conditions are not of the best. No. 5's have often been taken up and reused 25 times or more—pretty good going in anybody's mine!

Strong, thick section . . . plus full-length center support . . . means a tie that resists buckling, sagging, and bending. Though the No. 5 is slightly higher in first cost than the lighter ties, its extra life will more than offset the difference in purchase price.

Installing the No. 5 is no trick at all. Simply fit the stationary clip against the rail base; then tap the revolving clips into place. Repeat at the other end. There's your tie, ready for business, holding the rails in a double grip of steel.

We'd like to tell you more, and it makes good listening if you're interested in reducing track problems. Why not let a Bethlehem man give you the full story?

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BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Roof Control

It has been announced by Dr. James Boyd, director, U. S. Bureau of Mines, that a new Roof Control Section has been organized under the Health and Safety Division and charged with the task of lowering the high accident rate from falls of roof in both coal and ore mines.

Edward M. Thomas

The problem is now being attacked through education, investigation, and research. Field men conduct investigative studies and disseminate information to the industry via personal contact, lectures, and publications. The personnel at the College Park, Md., station of the Bureau are responsible for conducting research work on roof control in cooperation with other sections of the Bureau and with State and private agencies.

With headquarters at College Park, the section is composed of nine field engineers headquartered at Jellico, Tenn.; Norton, Va.; Mt. Hope and Fairmont, W. Va.; Vincennes, Ind.; Denver; Pittsburgh, Johnstown, and Wilkes-Barre, Pa. Three mining engineers are stationed at College Park.

The personnel of the section are available for consultation service on any phase of roof control by application to the nearest field office of the Health and Safety Division or to the College Park office.

A major project of the Roof-Control Section, attracting much attention from the mining public at the present time, is the adaption of roof bolting to more general use in mining. This type of support which a few years ago was used only locally has been fitted successfully to many difficult roof problems in widely separated localities in the United States.

Edward M. Thomas, mining engineer, U. S. Bureau of Mines, has been named head of the new section. Mr. Thomas is a graduate of the South Dakota School of Mines and Technology. Prior to entering the employ of the Bureau in 1936, he had ten years of varied operating experience in several States. Since entering the Bureau of Mines he has served as a mining engineer and as a coal mine inspector in the Health and Safety, Technologic, and Mining Divisions.

Ceramic Research

Installation of several research projects in the Division of Ceramics of the Department of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., provided a number of openings for qualified candidates. One is needed to operate an electron microscope for microscopic and electron difraction studies. Another candidate is needed to act as a group leader for research in the thermal conductivity of stable materials at elevated temperatures. Both of these openings carry an approximate annual salary of $5,000.

A minimum of five research assistants are desired to act as research staff on a half-time basis for several projects which involve studies of materials stable at elevated temperatures, their chemical, physical, and thermal properties. Also, two ceramic technicians are sought with experience in plaster mold making and slip castings techniques to supply the specimens required for research programs and to maintain equipment.

Ohio Mine Abandoned

Permanent abandonment of operations at its No. 52 mine near Rose Farm, Ohio, has been ordered by the New York Coal Co. Machinery and equipment of the mine, which employs 250 men, will be moved to Nelsonville.

Benson Mines Set New Record

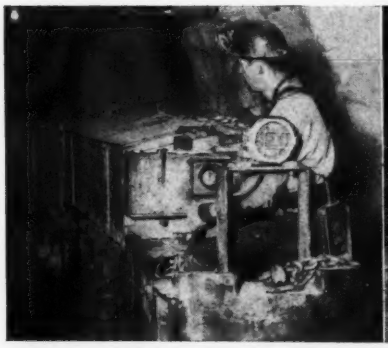
In May the Jones & Laughlin Corp.'s Benson mines at Star Lake, N. Y., set new tonnage records, in sinter and concentrate shipments in crude ore production, in martite concentrate production, and sinter production. Crude ore output during May totaled 242,620 gross tons.

Outstanding Annual Reports

In a survey of 4200 corporation annual reports for 1948, submitted in the Ninth Annual Survey conducted by the *Financial World*, 13 coal and coke companies qualified for "Highest Merit Award" citations. The qualifying companies are: Ayrshire Collieries Corp., Clinchfield Coal Corp., M. A. Hanna Co., Island Creek Coal Co., Lehigh Navigation Coal Co., Pennsylvania Coal Co., Pittsburgh Consolidation Coal Co., Philadelphia & Reading Coal & Iron Co., Pittston Co., Pond Creek Pocahontas Coal Co., Truax-Traer Coal Co., United Electric Coal Cos., and West Virginia Coal & Coke Corp.

One of these will be selected for a

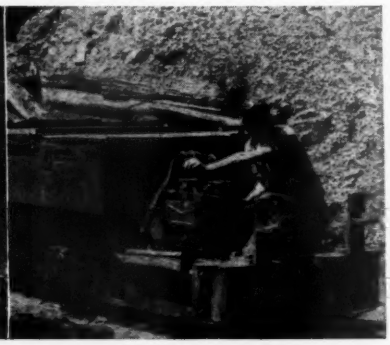
THEY EVEN SURVIVE WRECKS!



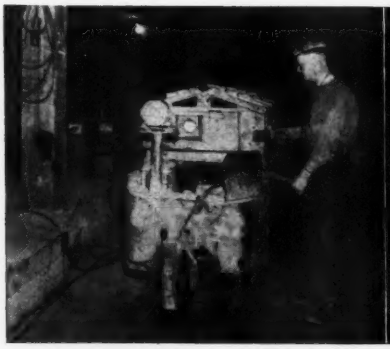
Edison mine haulage batteries have gone through many wrecks with little or no damage and still delivered a full life.

That's why maintenance men are not apt to get excited when they see a damaged group of cells coming into their shop.

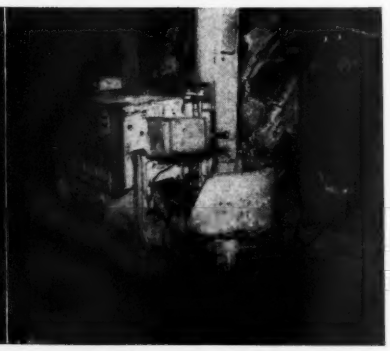
They usually just test, reassemble and send out again, expecting the cells to stand up just as they have done before.



They have learned from experience that Edison steel cell construction has no equal for rugged strength and endurance.



Users know that Edisons are economical and dependable and can be fully charged in 6 to 7 hours direct from d-c lines.



They need no critical rate regulation, give long life, can be stored indefinitely and are not temperature sensitive.

EDISON Batteries last and last, and so through the years cost less and less. If you do not already use them, get price quotations from us. You may find prices lower than you think; cost per year less than you pay now.

EDISON

Nickel • Iron • Alkaline

STORAGE BATTERIES

Typical Edison Trammer Battery

EDISON STORAGE BATTERY DIVISION OF THOMAS A. EDISON, INCORPORATED, WEST ORANGE, N.J.
IN CANADA, INTERNATIONAL EQUIPMENT CO., LTD., MONTREAL AND TORONTO.

"Best of Industry" and presented with a bronze "Oscar of Industry" at the *Financial World* Annual Report Awards banquet, October 31, 1949. A year ago the 1947 annual report of Pittsburgh Consolidation Coal Co., won the trophy in this industrial classification.

Nonmetallic Investigation

Geologists and field workers representing the State Research, Planning and Development Board of South Carolina are continuing investigations of mica and sillimanite deposits in the Piedmont section, according to a recent report from L. W. Bishop, board director. Field investigations will be made to determine whether there are any commercial possibilities in scrap mica in Anderson, Greenville, Spartanburg, Pickens, Oconee, Abbeville and Laurens counties.

Upon completion of the mica investigations attention will be turned to some deposits of sillimanite that have been found in the Piedmont section but none of which have as yet proven to be of commercial proportions.

Exploratory investigations are also being made of heavy mineral deposits in the coastal plain region. Particular attention is being paid to searching for commercial deposits of ilmenite and zircon.

Britain Plans Huge Preparation Plant

At Lynemouth Colliery, Northumberland, England, the National Coal Board is planning installation of one of the world's largest coal cleaning plants. It is designed to increase the output there from 564,000 tons a year to 1,500,000 tons, at the rate of about 800 tons per hour.

Three processes will be used in the new project. Coal between 8 in. and 1½ in. in size will be washed in a Ridley-Scholes washer; a sink-float method. Smaller coal, from 1½ in. to half a millimeter in size will be washed in a separate plant while the fine coal will be cleaned in a froth flotation plant.

Approximately two years will be required for completion of the new preparation plant which will cost £731,000.

Explosives Research Results

Two years of explosives research, highlighted by tests of new and safer explosives and improved methods of rock dusting to prevent the spread of coal-dust explosions are reported in a new U. S. Bureau of Mines publication. Eight new explosives have been placed on the permissible list as being safe for use in gassy coal mines.

At its experimental coal mine at Bruceton, Pa., the Bureau determined that the incombustible content of coal dust should be increased to at least

65 percent through rock-dusting, and that rock dust should be applied to within 40 ft or less of the mine faces in order to prevent the spread of a coal-dust explosion.

Copies of the Report of Investigations 4502 may be obtained from the Publication Section of U. S. Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa.

Georgia Iron Ore

The Hodge Mining Co., near Cartersville, Ga., has been utilizing open-pit methods to produce brown ore which is sold under contract to a large steel company that takes the entire output. Over 1,500,000 tons of washed ore have been shipped since 1942. Although individually owned, the Hodge Mining Co. is the largest mining company in the state of Georgia and the mine is 32nd in size of the country's iron ore mines.

No explosives are used as the heavy compact ore is broken loose by a 1½-yd shovel at an average rate of 3000 cu yd per day.

Alan Wood Reduces Output

At its Scrub Oak mine near Dover, N. J., the Alan Wood Steel Co. has placed production on a week-on and week-off basis. The mine, which accounts for about one-third of New Jersey's iron output, has been producing 20,000 tons of concentrate and 60,000 tons of crude ore a month. The company gave the reduced steel market as the reason for curtailing output.

Helicopter Serves Mine Official

A three-place Bell Helicopter has been rented by the Pittsburgh Consolidation Coal Co., to provide convenient transportation for trips to the company's operations in Ohio, West Virginia, Pennsylvania and Kentucky. R. L. Ireland, chairman of the executive committee of the company, plans to use the helicopter to save time in covering the mine operations.

Locomotive Efficiency

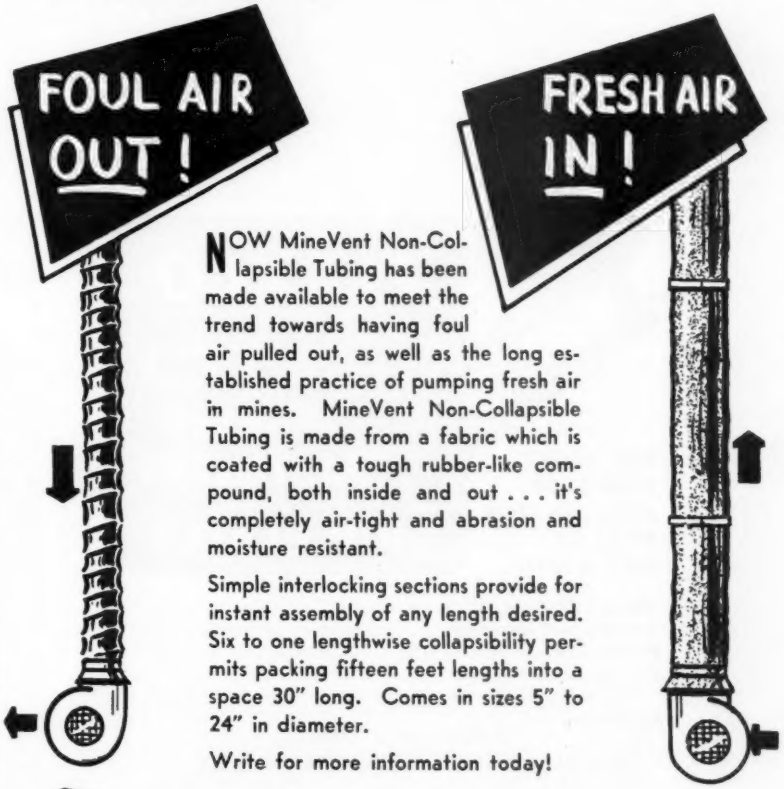
In the Interstate Commerce Commission's report of February 1949, coal-burning steam locomotives were recorded as handling 34 percent of total passenger train car miles; in the April report such locomotives were handling but 30.2 percent. In contrast, Deisel power showed an increase from 44 percent of passenger train car miles in February to 47.5 percent in April. Gross ton miles hauled by coal-burning steam locomotives handling freight declined from 54 percent in February to 53.4 percent in April. However Deisels went up from 29 percent in February to 31.5 percent in April. In the period from 1921 to 1947 the amount of coal or its equivalent consumed in Class I railroad freight engines was reduced from 162 lb to 114 lb per each 1000 ton miles.

Reducing this data to a ton mile average, railroads are moving a ton one mile with about two ounces of coal or two tablespoonfuls of fuel oil when using steam locomotives. With Diesel locomotives, however, the same work is done with 1.2 teaspoonfuls. Thus, a tablespoon holds three times as much as a teaspoon, the Diesel advantage over steam locomotives using fuel oils is approximately five to one.

L. E. YOUNG
Consulting Engineer
Mine Mechanization
Mine Management
Oliver Building Pittsburgh, Pa.

J. W. WOOMER & ASSOCIATES
Consulting Mining Engineers
Modern Mining Systems and Designs
Foreign and Domestic Mining Reports
NATIONAL BANK BLDG.
WHEELING, W. VA.

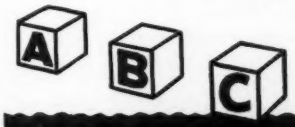
NOW! NON-COLLAPSIBLE
MineVent FLEXIBLE TUBING!



NOW MineVent Non-Collapsible Tubing has been made available to meet the trend towards having foul air pulled out, as well as the long established practice of pumping fresh air in mines. MineVent Non-Collapsible Tubing is made from a fabric which is coated with a tough rubber-like compound, both inside and out . . . it's completely air-tight and abrasion and moisture resistant.

Simple interlocking sections provide for instant assembly of any length desired. Six to one lengthwise collapsibility permits packing fifteen feet lengths into a space 30" long. Comes in sizes 5" to 24" in diameter.

Write for more information today!



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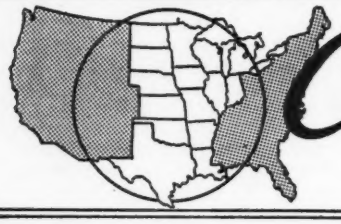

Central States

Underground Conveyor Belt

The Cleveland-Cliffs Iron Co. will install an inclined underground belt conveyor in the Cambria-Jackson iron mine, Negaunee, Mich. The installation will lift iron ore from the 7th level to a higher discharge point. A vertical lift of 110 ft will be accomplished by a belt 594 ft long on a 15 deg incline.

Lignite Research Laboratory

Fifteen bids for the construction of a U. S. Bureau of Mines lignite research laboratory at the University of North Dakota were recently opened. The main purpose of the laboratory, which will employ about 50 persons, will be to increase the utilization of lignite coal for power and heat. Processing of lignite coal will also be studied. Congress has appropriated $750,000 for the construction of the laboratory and purchase of necessary equipment. For general construction work, Johnson, Drake & Piper, a Minneapolis firm, submitted the low bid of $376,565, while Egan & Sons of Minneapolis were low bidders for the plumbing and heating work at $98,732. The Albert B. Hankey Co. submitted low bid of $38,367 for the electrical work. Eight general contractors, five plumbing and two electrical bids were received. The three low bids must be approved by the director of the Bureau of Mines before contracts are awarded.

Manganese Tests

The U. S. Bureau of Mines is conducting tests on a small Black Hills, S. D., manganese deposit, it was recently revealed by the State natural resources commission. The commission said the Strawberry Hill Mining Co.'s deposit, south of Deadwood, showed an estimated 10,000 to 35,000 tons of ore.

Jalore Exercises Option

The Jalore Mining Co., Ltd., a subsidiary of the Jones & Laughlin Steel Corp., has been carrying on a consistent program of exploratory diamond drilling on the Michipicoten iron range, Ontario. The company recently notified the owners of the land that it will exercise its option and become lease-holders of the two iron ore properties, the Ruth and Lucy. The deposits will be mapped and the ore studied in the Jones & Laughlin ore research laboratory at Negaunee, Mich.

Coal Producers Deed Land to State

The Central Indiana Coal Co., Indianapolis, and the Maumee Collieries Co., Terre Haute, recently presented deeds to 2100 acres of land in southern Indiana to the state. The area is to be added to the Greene-Sullivan state forest. It includes 13 lakes, well stocked with fish, and is heavily populated with wild life. Trees have been planted on the acreage by the Indiana Coal Producers Association in accordance with state law which requires making such land usable again.

The Central Indiana Coal Co. donated 1500 acres and the Maumee Collieries Co. donated 600 acres. In 1937 the Central Indiana Coal Co. donated 1728 acres to the state.

Government Owned Zinc Plant Sold

The Hegeler Zinc Co. recently purchased for $75,000 the government owned part of a zinc plant at Danville, Ill. The plant, consisting of roaster and sintering facility, was operated as a part of the Hegeler Zinc Co.

Students Visit Mines

During July, students from the Michigan College of Mining & Technology visited various mining sections of the country. The trip included an inspection of mines in Michigan's iron country and the Minnesota Iron Range. The Homestake Mining Co. in Lead, S. D., was visited. In Utah the coal mining operations at Drageron and the copper mines in Bingham County were seen by the group. The lead and zinc workings of the Combined Metals Reduction Co. in Nevada were inspected. After visiting the copper mines of Arizona the students went to Colorado, where they visited the gold, lead, zinc, and molybdenum mines.

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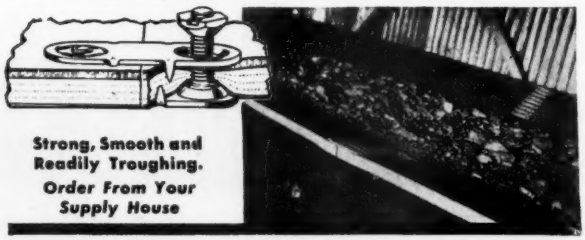

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Iron Mining Costs

Statistics compiled by the Michigan Department of Conservation, Geological Survey Division, reveal that during 1948 the cost of mining a ton of iron ore in underground mines in Michigan averaged $5.3387, compared with the average cost of $4.9112 in 1947, and with a $4.7671 average over the preceding five-year period. The statistics were based upon costs of labor and supplies, deferred costs, taxes, general overhead, transportation and marketing costs.

Cost per ton of ore from the siliceous open-pit mines in the state averaged $3.1379 in 1948, compared with $2.6484 in 1947. Cost of mining underground ore on the Menominee range averaged $4.7089 per ton, compared with $5.4915 per ton on the Marquette range and $5.8079 on the Gogebic range.

Illinois Miners' Examination

Examinations for candidates for miners' papers were held in 12 Illinois cities during August, according to Walter Eadie, state director of mines and minerals. Candidates were required to produce evidence of at least two years' practical experience.

Largest Ore Carrier Launched

Inland Steel Co.'s new ore carrier, the "Wilfred Sykes," was launched on June 28 at Lorain, Ohio, in the yard of the American Ship Building Co. The new vessel is 678 ft in length and will carry 20,000 long tons at intermediate draft at a speed of 16.5 mph. Heavy equipment is being installed in the hull and the ship is scheduled for operation for 1950 navigation season.

New Shaft Mine Planned

It was recently announced by Roland Wilson, general superintendent, Freeman Coal Mining Corp., that a new shaft mine would be opened near Farmersville, Ill. The tipple, rails, and other equipment recovered from abandonment of a nearby mine will be moved to the new site.

Radio Communication Aids Mine

The Fidelity Mine of the United Electric Coal Company near Pinckneyville, Ill., has installed a radio system similar to those used by State police. It is used to dispatch instructions to various mine locations and communicate with operational supervisors in a 25-mile area.

Students Take Field Trips

Michigan College of Mining and Technology students of mining engineering and geological engineering took extended summer field trips as a part of their regular course of study. Mining students, under the supervision of Professor J. Murray Riddell, covered operations in Michigan, Minnesota, and the Western States. Under the leadership of Dr. A. K. Snelgrove, geological engineering students took field trips on Michigan's Upper Peninsula.

In Michigan, the miners covered the Marquette, Menominee, and Gogebic ranges, and in Minnesota the Vermilion, Mesabi, and Cuyuna iron ranges. Surface plants and loading operations, as well as underground mining, were studied.

The Western inspection trip covered operations in South Dakota, Wyoming, Utah, Nevada, Arizona, and Colorado.

Practicing engineers from the Oliver Iron Mining Co., the Snyder Mining Co., and the New Jersey Zinc Co., were enrolled as special students in the inspection courses.

Geological engineering students spent their first week in the copper country studying the Keweenawan series, the second week in the Marquette area mapping pre-Cambrian rock structures, and the third week on the Gogebic Range. The fourth week was spent in a general study of the stratigraphy of the pre-Cambrian as exposed in the Upper Peninsula of Michigan.

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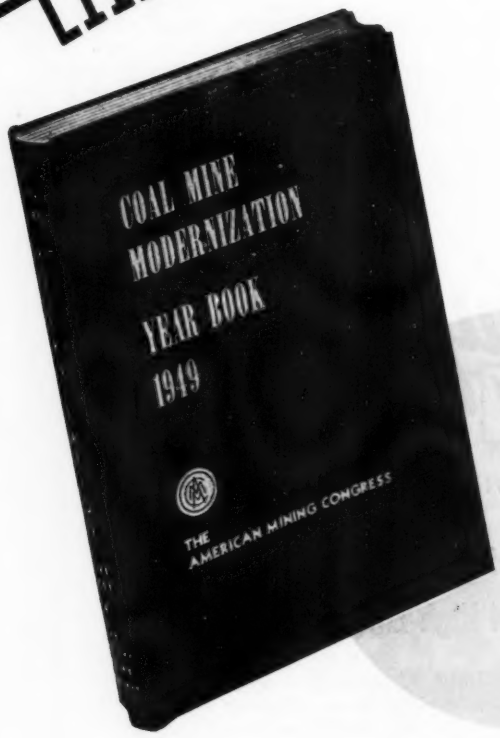

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Making Money

(*Continued from page 40*)

or weight appears, this fact is certified to the President; and if, on a view of the circumstances of the case, he so decides, the officers implicated in the error are thenceforward disqualified from holding their respective offices.

Metal Tonnage Used

During the calendar years 1943 to 1947, inclusive, the mints produced approximately ten billion domestic coins and about three and one half billion coins for other governments. The approximate tonnage of metal used in this production was as follows:

	Tons
Silver	15,644
Copper	33,823
Zinc	1,893
Nickel	908
Manganese	388
Zinc-coated steel	3,397
Tin	1
Nickel-silver	650
Total	56,704

The yearly coinage by tons was as follows:

	Tons
1943	9,412
1944	15,107
1945	16,277
1946	11,072
1947	4,836
Total	56,704

The zinc-coated steel which was used for the 1c piece during the calendar year 1943 was not melted or rolled by the mints. The coated metal was purchased in strip form and blanks were punched and coined therefrom. Zinc-coated steel blanks, ready for coining, were also purchased.

All waste material known to contain, or likely to contain, gold or silver is known as "sweeps." It consists of broken crucibles and dipping cups; burnt aprons, gloves and packages in which bullion has been sent to the mint; residues from settling tanks; in short, anything which may contain precious metals.

All material of this kind is sent to the sweep cellar and crushed between rolls. The brittle materials are reduced to coarse powder and any pellets are separated by sifting. These metallic particles are melted down and sent to the refinery. The powdered material is sampled, assayed and sold to smelting companies.

At the present time mint institutions have in their custody over 24,013 tons of gold bullion with a value of over $24½ billion, and silver holdings exceeding 35,160 tons.

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Western States

Oil Shale Mining Demonstration

From September 7 to October 4 a public demonstration run will be made in the experimental oil shale mine of the U. S. Bureau of Mines near Rifle, Colo. In the month-long test, unique equipment and practices employed in achieving low-cost volume production will be demonstrated. A new determination will be made of the direct costs of mining oil shale. Earlier test runs have achieved direct costs of less than 50¢ a ton and production rates exceeding 100 tons per man-shift underground.

A four-drill jumbo has been developed with which two men can drill a 15-ft, 72-hole round in a 27 by 60-ft heading in six hours. This round breaks 1500 tons of rock. The broken shale is loaded by a 3-cu yd electric shovel into 15-ton Diesel trucks.

Visitors during the demonstration period will have an opportunity to see mining operations carried on as well as be able to visit the oil shale demonstration plant where the gas flow shale retort and new experimental refinery will be in operation.

Wyoming Coal Mine to Resume Operation

The Blind Bull coal mine in the mountains of northern Lincoln county near Afton, Wyo., will soon be in full operation again. Bert Ruud, manager of the mine, reported installation of new machinery including a loading machine. Coal is trucked from the mine to market. The mine is located on Grey's river.

Unions Continue Anaconda Contracts

In referendums in four Montana cities on July 8, four unions of the International Union of Mine, Mill and Smelter Workers (CIO) voted overwhelmingly to continue the present wage scale of their contract with the Anaconda Copper Mining Co. for one year, from July 1, 1949, to June 30, 1950. Butte Miners Union No. 1 voted 2375 for and 386 against the proposal which resulted from negotiations between a joint committee of unions and management. The union committee offered to continue the current wage scale and this was accepted by the company, subject to ratification by members of the unions. Anaconda Mill and Smeltermen's Union No. 117 voted 1624 for and 73 against. Butte Stationary Engineer's Union No. 83 voted 244 for and 21 against. Great Falls Mill and Smeltermen's Union No. 16 was 760 for and 255 against.

PCA's Supplemental Shafts Stopped

In December 1947, the Potash Company of America, Carlsbad, N. M., announced proposed sinking of two supplemental shafts, Nos. 3 and 4. These shafts were designed to improve conditions and aid development of the company's potash mines.

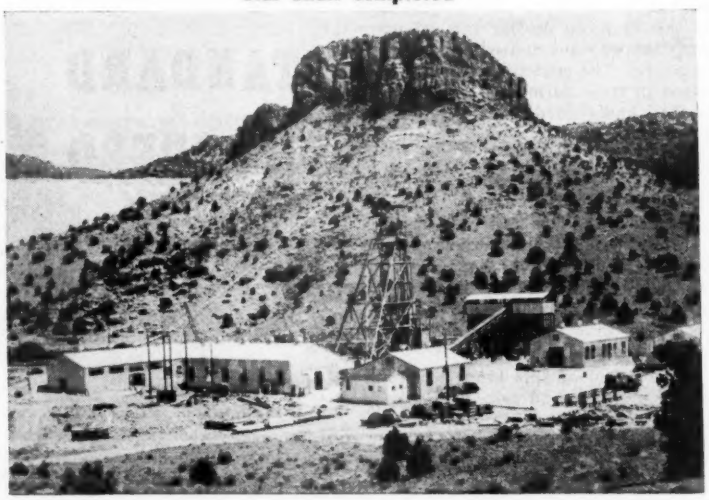
By the end of December 1947, the excavation of shaft No. 3 had reached a depth of 66 ft and concreting was completed to 64 ft. Heavy flows of water and running sand were encountered. Grouting was attempted to stop the flow of water and sand but proved only partially successful.

The water flowed in at a rate of over 100 gpm and started the ground to moving behind the walls and the steel reinforced concrete. A break occurred in the concrete at 48 ft depth and a section of the shaft lining settled. The work on shaft No. 3 was halted on February 18 at a depth of 74 ft after a total expenditure of $108,189.80 or $1,462.02 per ft. In order to furnish the required additional air for the mine, which was intended to be supplied by shaft No. 3, a fan was installed at the bottom of No. 2 shaft.

In sinking the No. 4 shaft, grouting was begun early by drilling two holes about 6 ft from each of the west corners of the shaft and concrete was pumped in to seal off the water at the 65 ft zone. By February 1948, the shaft had reached a depth of 89½ ft, all concreted. After five months lapse of operation, work was resumed on August 2, 1948. When the water had been pumped out and repairs made in the shaft's walls, sinking operations began again. At a depth of 114 ft the shaft was flooded out. Pumps were installed and the flow was found to be about 500 gpm. Grouting was poured into the shaft at an ever increasing rate. Sawdust and caliche were used to fill the voids and calcium chloride and sodium silicate were added to speed the setting rate.

At 125 ft water broke through the bottom and was measured at 530 gpm. Additional pumps and a 6-in. discharge line were installed. By the end of November 1948, 10,180 sacks of cement had been used for grouting

Star Shaft Completed



Headframe and surface plant of American Smelting & Refining Co.'s new 1900-ft, four compartment Ster shaft on its Ground Hog unit, located near Santa Rita, N. M. The new shaft will be put into operation in September and will replace the one now in use. Ore hoisting capacity will be doubled although potential capacity may not be used unless market conditions for lead and zinc warrant full operations. The Star shaft was begun in December 1947. All underground operations on this property were suspended on July 15 due to low metal prices. Construction work, however, continues. Work has started on another shaft, known as No. 5, on the Ground Hog property approximately 4000 ft from the Star shaft.

alone. By the end of February 1949, the shaft had been sunk to a depth of 132 ft and progress was almost negligible. On March 2, 1949, a crack appeared in the bottom and water began coming in rapidly and rose to the 50 ft level in a few hours. The water coming in at the rate of over 1000 gpm was finally sealed off at 116 ft, approximately 19 ft from the shaft bottom. This was accomplished by pouring concrete into the bottom of the shaft.

At the end of March 1949, the 135 ft level had again been reached in the center compartment and clean-up work was progressing in the other two. The total cost of No. 4 shaft up to this stage was almost $300,000.

A survey is being made of other methods of shaft sinking under similar conditions. One plan would require the drilling of several wells near the shaft with deep well pumps for lowering the water level in the vicinity of the shaft. Freezing of the water in the formation is also being investigated. Experienced experts have been called in to study the conditions and furnish data on the cost of completing the shaft by this method. In the meantime all operations at the No. 4 shaft have been stopped.

Idaho Association Officers Elected

At the annual meeting of the Idaho Mining Association at Sun Valley A. H. Shoemaker, manager of the Triumph mine at Hailey, was elected president; Henry L. Day was elected vice-president; and Harry W. Marsh was reelected secretary. Robert N. Hardy, Jr., R. W. Neyman, J. C. Kieffer, H. D. Bailey, G. H. McHigh were appointed as the executive board of directors.

Nonferrous Mines Cut Production

Sagging prices for metals, principally copper, lead, and zinc, have resulted in many of New Mexico's mines either closing or curtailing operations. As of June 29 mine employment figures had dropped roughly 30 percent as compared to May 1949.

In Hidalgo county the Banner Mining Co. and the Atwood Copper Mines are operating at about 50 percent capacity after laying off 50 men.

In Grant county, the Kennecott Copper Corp. has closed its lead-zinc Oswaldo mine and has gone to a 40-hour work-week in its copper operations. The U. S. Smelting Refining and Mining Co. has closed its extensive lead-zinc operations and developments affecting about 450 men. The Peru Mining Co. and New Mexico Consolidated Mining Co. have closed the Kearney and Pewabic mines and the Deming concentrator affecting about 200 men. The Empire Zinc Co. went to a 40-hour work-week on the first of July as did the American Smelting & Refining Co. Operations of the Phelps Dodge Corp. at Tyrone have been closed.

In Socorro, Sierra and Santa Fe counties many operations have ceased all production. The current loss of production is serious but the major damage may be realized in the future when the added costs of reopening abandoned mines is faced.

Alaskan Mineral Development

With the object of forwarding Alaskan mineral development, expansion of its mines and other resources, a new Seattle Chamber of Commerce committee has been organized. John Perry is chairman; Stanley Stretton of the Standard Oil Co. of California is vice-chairman. Ernest N. Patty of Alluvial Golds Inc. and Volney Richmond, Jr., are members of the committee.

Indiana Mine Extends Raise

The new raise at the Indiana mine has been completed from the 400 to to the 300 level and is being extended from the 300 to the 200 level. The old raises from the 200 to the surface are being repaired for use. A small production of copper-lead-silver-ore is reported. The Indiana, consisting of 15 claims in the Silver Hill mining district, Ariz., is owned and managed by Sydney J. McNeil, Marana, Ariz. A crew of six is employed under the superintendency of A. Macfarlane.

Great Falls First Aid Contest

The annual first aid contest of the Anaconda Copper Mining Co. held at the Civic Center arena in Great Falls, Mont., late in June was won by Zinc Leaching No. 1 team captained by Joseph Wampol, marking a 98.9 percentage. Eleven teams, ten from Great Falls and one from East Helena, participated. Other members of the winning team were Albert Jorgenson, Bert Anderson, Grover Smith, Edwin Wettels and Albert J. Tuss. Tieing for second place were the Shops No. 2 team and the Wire Mill teams, with scores of 97.6 percent. Ties also resulted for third and fourth places. Zinc Electrolyzing team and the Combined team were tied at 97.4 percent for third and Zinc Roasting and Electrolyzing Copper Refinery teams were tied at 97.2 for fourth. Prize money totaling $564 was distributed with first place worth $150. A similar contest was held in Butte earlier in the month. An outstanding safety award was presented manager R. B. Caples of the Great Falls Reduction department for its outstanding safety record in 1948. The award, the Joseph A. Holmes Safety Association certificate, was made by E. H. Denny of Salt Lake City, engineer for the Bureau of Mines.

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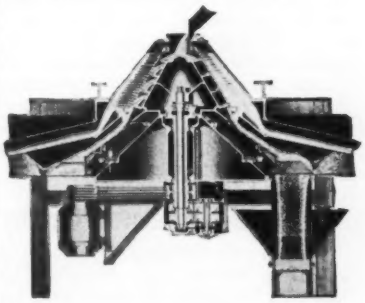

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Silver King Shuts Down

Silver King Coalition Mines Co. joined New Park Mining Co. and Park Utah Consolidated Mines Co. in the Park City, Utah, area in shutting down its operations late in June. The company's board of directors announced the closedown as effective July 1. About 400 men were affected. General Manager James Ivers said the high cost of wages in proportion to reduced market value of lead and zinc was the reason for the board's decision. Previously, New Park Mining Co. and Park Utah Consolidated Mines Co. had shut down. Their action came after members of the Progressive Metal Workers Council (CIO) refused to take a wage cut of $2.50 a day to keep the mines open. About 475 men were employed at the two mines.

Montana Mines Elected to Research Council

Montana School of Mines in Butte has been elected to active membership in the Engineering College Research Council of the American Society for Engineering Education. Notice of this recognition of the research program conducted by the school in mineral dressing, metallurgy and mining was received by Dr. Francis A. Thomson, president, from Dean F. M. Dawson of the University of Iowa, who is chairman of the research council. The recognition extended by the council is regarded as formal recognition of the high standards of work being done and places Montana Mines on a par with larger scientific schools of the nation.

Dayton Mill Operates at Capacity

Dayton Consolidated Mines Co. is operating its mill at Virginia City, Nev., at capacity on company and custom ore. Present mill feed is coming chiefly from the Dayton open pit. Underground mining is progressing through the New York shaft for production of gold-silver ore from the 600 and 700-ft levels.

Progress on Kennecott Refinery

Construction of the $16,000,000 electrolytic refinery of Kennecott Copper Corp. is going ahead on schedule, it was recently announced by C. T. Jensen, assistant plant engineer at the refinery. The key building, a 410 by 546-ft tank house, has been bricked and 340, or 25 percent of the electrolytic cells, have been completed inside the tank house. The lead-lined concrete cells are 4 ft 4 in. wide; 14 ft 3 in. long and 5 ft deep. Foundations have been laid for all buildings at the plant, and steel foundations have been completed at the casting building and warehouses. Steel is in process of erection at other plant buildings. The 700-man crew is expected to complete all construction by 1950.

North Lily Halts Operations

Officials of the North Lily Mining Co. recently announced the shutdown of its operation near Eureka, Utah, on July 1. Lack of exploration possibilities was cited as prompting the shutdown. The recent slump in lead and zinc prices had a minor effect on the decision to discontinue work, as gold and silver are the principal products.

Drumlummon Back in Production

Production has been resumed in the historic Drumlummon mine near Marysville, Mont., following repair of damage to the gold mine caused by a cave-in eight months ago. Miners escaped after the cave-in blocked the mine's main working shaft. The mine is operated by the Montana Rainbow Mining Co.

Lupton Plans New Tunnel

The Lupton Mining Co. is driving a 1500-ft tunnel under its Great Grizzley Gulch group of mines above Silver Plume, Colo. According to Eliss P. Lupton, president of the company, the tunnel will open up an ore body of lead and silver ore below the present Grizzley mine and will enable the Lupton mill at Georgetown to resume full production on a daily basis of three shifts. The company reports expenditures of more than $300,000 in Clear Creek and Gilpin counties since the war.

Alaska Aluminum Project

An aluminum reduction plant requiring an initial investment of about $300,000,000 may be constructed in the Skagway area of Alaska. This summer a field party is being sent out to investigate the possibilities. George Sundborg, consultant to the Alaska Development Board, has announced that Dr. Warren J. Mead, head, Geology Department, Massachusetts Institute of Technology, is expected to lead the expedition.

Lucky Friday Concentrates

The Lucky Friday Silver-Lead Mining Co. has received smelter net returns of $112,288.83 for seven carloads of silver-lead concentrates shipped over the period from April 25 to May 25. The shipment averaged per ton, 187 oz silver, 58.20 percent lead, and 2.5 percent copper.

A stockpile of about 1000 tons is available for milling and the mine is producing about 50 tons per day from stopes above the 1400 level. Sinking was recently started in the main shaft and has been completed to the 1600 level where a station and skip pockets have been cut. If this development is satisfactory the shaft will be continued to the 1800 and 2000 levels.

For Sale

30 Ton, Used Mechanical Bottom dump coal haulers, Autocar Model DU-100T — Cummins Diesel—3 to 5 units—Illinois inspection. $8,000 each.

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Summit King Mines

Summit King Mines is reported to be milling 50 tons of gold-silver ore daily at its properties in the Sand Springs field, 25 miles east of Fallon, Nev. Ore reserves are said to have been materially enlarged by the development program carried on last year under direction of Manager P. O. Dobson, and the mill is understood to be treating profitable material.

Holiday Chrome Deposit

A substantial tonnage of shipping grade ore has been reported disclosed by development of the new Holiday Chrome property in the Patrick's Creek area near Crescent City, Calif. Discovered a few months ago by E. A. Carlson, the Holiday is said to contain a chrome orebody about 200 ft wide in surface workings. The property was recently leased and optioned by John Armstrong, engineer for Chromium Smelting Corp., of Spokane.

Anaconda Closes Two More Mines

Officials of the Anaconda Copper Mining Co. in Butte recently announced the shutdown of two more of its mines, citing the low price and lack of demand for zinc as the reasons. The mines affected were the Badger State in Butte, and the Darwin mine at Darwin, Calif. The former is a zinc mine and employed approximately 280 men, while the latter produced zinc and lead and employed 150 men. The Badger State is the fourth zinc unit which has been shut down in the Butte district.

Rocky Mountain Coal Mining Institute

At its 45th regular meeting held in the Colorado Hotel, Glenwood Springs, Colo., those attending heard comprehensive papers on various phases of the coal mining industry. The program of Bituminous Coal Research, Inc., was outlined by J. B. Morrow, vice-president, Pittsburgh Consolidation Coal Co. Dr. L. E. Young, president, AIME, and consulting engineer, spoke on research in underground coal mining. The coal mining curriculum recently established at the Colorado School of Mines was discussed by Albert M. Keenan, chief of the school's coal mining division.

Automatic hoisting was considered by D. E. Renshaw, Westinghouse Electric Corp., and Frank E. Ryan, Sterling Steel Casting Co., discussed the manufacture and use of steel wheels.

Hazards of electric shocks received from induced voltage in trailing cables were pointed out by W. C. Painter, service engineer Joy Mfg. Co. Clyde E. Osborn spoke on the use of heavy media separation and described plants built by Western Machinery Co. A paper on mining a thick seam with belt conveyors by H. C. Livingston was presented by J. M. Charles, chief engineer of the Union Pacific Coal Co.

The feature of the meeting was the symposium on "Safety for Modernization." State mine inspectors from Utah, New Mexico, Wyoming, Colorado, together with representatives of the U. S. Bureau of Mines and Geological Survey entered into the discussion.

At the business meeting of the Institute, Glenn E. Sorenson was elected president to serve for 1949-50. Fred E. Whiteside was elected secretary-treasurer and C. E. McWhorter, T. R. McCourt, W. Johnson and J. Garcia were elected vice-presidents.

New Haulage Tunnel

(*Continued from page 31*)

automatic signals at each of the four passing sidings. All track switches will be electrically operated by the trolley pole.

The assembly yard in the Wheelwright Mine was established in an air course adjoining the main heading. The air course was widened to 28 ft to accommodate three tracks: a track for loads, a track for empties and a run-around track in the center. The yard is 2200 ft long and will hold two 60-car trips of loads and two 60-car trips of empties. A series of crossovers between the loaded and run-around tracks and between the empty and run-around tracks will permit a locomotive that pulls a trip onto the yard, behind cars already on the yard, to get onto the run-around track with no delay. The dispatcher's office will be conveniently located at the assembly yard where he will direct all traffic by telephone and trolley phones.

The coal seam in the area of the assembly yard is extremely undulating and to avoid the possibility of runaway cars, all track grades within the yard were laid out not to exceed 0.4 percent. A maximum fill of 5 ft had to be made at one place in the yard and a maximum cut of 5 ft was made at another place. There is sandstone top through most of the length of the yard. In one section it was necessary to shoot down 4-5 ft of top rock to get the 5 ft clearance over rail desired; but in shooting, a weak slate strata above the sandstone was exposed for a distance of 400-500 ft. Because this weak strata appears dangerous, preparations are now under way to support this section of roof by means of suspension rods.

The tunnel project will not be completed for several months, but will be ready for use before the completion of the coal preparation plant.

Monarch Gold Mine

Rehabilitation of the Monarch gold mine near Sierra City, Calif., has been nearly completed and a five-stamp mill has started on profitable ore. Manager W. C. Ennis estimates that old workings contain between 50,000 and 75,000 tons of milling ore, some of it high grade. He is completing preparations for extensive development of new ground believed to contain good ore bodies. Replacement of the small mill with a larger capacity one is planned. Operated on a large scale 40 years ago by Gillespie interests of Pittsburgh, Pa., the Monarch is said to have produced ore valued at more than $750,000 and is believed to contain extensions of rich veins worked years in adjoining Sierra Butte, formerly a great gold producer.

Wheels of Government

(*Continued from page 42*)

Public Lands, would provide up to $20,000,000 annually for a five-year period ending June 30, 1954, to permit the Department of Interior to enter into written contracts providing funds for exploration projects for strategic and critical minerals. Engle's bill, H. R. 976, is still before the House Committee on Rules, but it is understood that he has encountered discouraging opposition to this measure.

Mining Contract Claims

On July 11 the President vetoed Rep. Clair Engle's (Dem., Calif.) Mining Contract Claims bill, which would have compensated persons for losses suffered in attempting to supply strategic or critical minerals for the war effort. Chief White House objection was that the bill would include compensation for losses which occurred in attempting to supply such metals and minerals even when no contract was entered into and no Government officials knew of the effort being made to supply the material.

Meanwhile, Senator Pat McCarran has introduced, and his Judiciary Committee has reported to the Senate, his bill S. 2294, which would also amend the Contract Settlements Act of 1944. McCarran's bill differs from the vetoed Engle measure in that no claims would be paid by any agency, court or branch of the Government until Congress acts. The mining claimant would present his case to the contracting agency, which after making certain determinations would forward its recommendations and findings to the U. S. Bureau of Mines. The Bureau would review them and report to Congress giving: (1) a statement of the nature of the claim; (2) the amount determined by the contracting agency to be payable; (3) the amount determined by the Bureau of Mines to be properly payable; and (4) any other information which would be helpful to Congress in determining the amount properly payable.

BOOK REVIEW

"MORE PROFIT IN MECHANICAL MINING," *by A. Wayne Bitner and David R. Mitchell, the Mineral Industries Experiment Station, Pennsylvania State College, State College, Pa. $3.00. 38 pages.*

IN a pictorial manner this book presents simple procedures for making time, method and production studies in mechanized mine sections. It also shows how such studies can be evaluated to get greater productivity of men and machines. Although the study is mainly applied to shuttlecar operations, it may readily be applied to the analysis and rating of other types of mechanical sections.

Over 100 mines were surveyed in compiling the data required for making a combined survey involving time, methods and production. These chapters of the book tell how to time underground operations and suggest methods for streamlining sections for greatest efficiency. The chapter on the production study tells how to rate the section, calculate the foreman's rating and interpret the study.

Specific examples and illustrations are included and suggestions are offered for attaining higher efficiency, greater safety, more tons per manshift, and lower cost per ton.

Manufacturers Forum

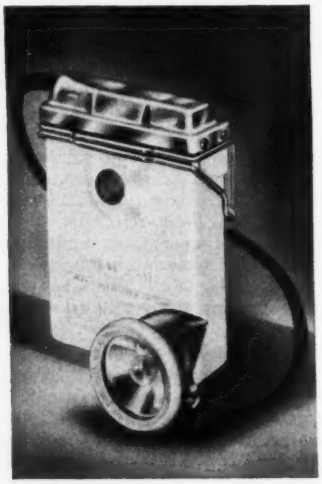
Motor Operated Valve

A simplified fluid-motor operator for gate valves has been announced by the Crane Co., Chicago. The new unit has been designed for ready adaptation to standard valves or to valves already installed. Either water, oil, or compressed air or gas can operate the device.

Five flexible diaphragms mounted radially about an eccentric on the drive shaft provide power for the operation of the motor. The operating fluid is admitted in rotational sequence to these diaphragms which actuate pistons that transmit the thrust to the eccentric through a roller bearing mounted on the shaft. Operating fluid can be admitted through either of two entrance ports to control the direction of operation of the motor for opening and closing the valve. Valves equipped with the new fluid motor operator are available in sizes ranging from 4-30 in.

New Wheat Lamp Introduced

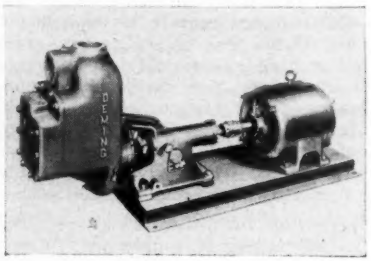
National Mine Service Co. has announced the introduction of an advanced Wheat "Forty-Niner" electric cap lamp. The new lamp embodies many desirable features. Butalite plastic forms the battery jar of the lamp providing a strong, durable, and extremely impact-resistant case.



Stainless steel is used for the top of the battery jar. Although there has been no increase in the battery size, it is reported that the lamp has 25 percent greater light output as a result of the increased capacity of the battery. Light beams may be adjusted by a simple mechanism to form a spot.

Self-Priming Pumps

The Deming Co. has announced six stationary models of self-priming pumps to cover a range of capacities from 10 to 300 gpm against heads up to 250 ft. These stationary types are



designed for general industrial pumping services, mine gathering service, or sump dewatering. Priming is claimed to be fast, automatic, and reliable, on suction lifts up to 25 ft.

Impellers are designed to permit passage of usual size solids encountered in dewatering service. Construction of the impeller is such that it may be adjusted for wear.

Grid Construction Improves Battery

A new line of batteries has been announced by the Gould Storage Battery Corp., Trenton, N. J. Greater motive power, Diesel-starting, and railroad air conditioning and car lighting performance are claimed for the "Z"-plate line.

Development of the new type of grid is based upon research that showed that positive grids of lead acid batteries failed because the grid-members separated after performing a certain amount of work, and further that this separation was caused by voids and porosity invariably present in the grid framework as cast.

WEMCO Assigned Flotation Unit

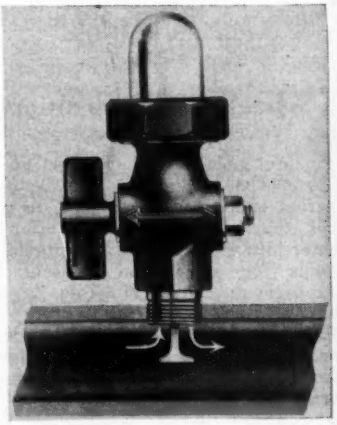
Negotiations have been completed with Bethlehem Steel Co. whereby the Western Machinery Co. has been assigned exclusive manufacturing and sales rights for Steffensen flotation machines. The Steffensen machine is of the pneumatic type and employs an air dispersion principle to produce quantities of small bubbles with a high total bubble area. The units will be manufactured at the company's Sacramento, Calif., shops.

Car Shakeout

Robins Conveyors Division of Hewitt-Robins Incorporated has announced introduction of a new, lighter weight Robins car shakeout, Model GS. The unit is designed to unload up to 15 hopper-bottom cars of granular material in a day.

Liquid Sight Glass

By a means of a valve-type sight glass, designed and manufactured by Worthington Pump and Machinery



Corp., Harrison, N. J., clarity or turbidity of transparent liquids flowing under pressure through pipe lines may be observed. Through differential pressure, liquid is allowed to circulate continuously through a glass observation bowl. A valve is provided which permits removal of the bowl for cleaning.

Shuttle Car Disc Brake

Technicians of the Goodyear Tire & Rubber Co. have adapted the airplane-type, single disc brake for use on shuttle cars. Shuttle cars equipped with this brake have undergone a year of test operation in a southern Illinois coal mine. There it has been reported that the shuttle car down time has been reduced by more than 50 percent.

The Joy Mfg. Co. is reported to be installing the single disc brake on all new shuttle cars, the Continuous Miner, and some loading machine models. The brake is also available for installation on older model machines now in field service.

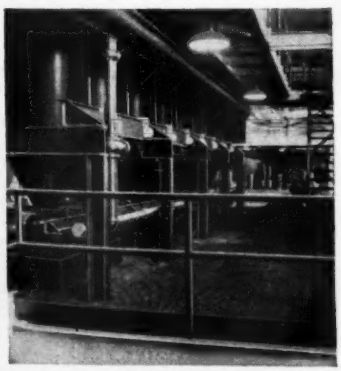
Single-disc brakes for prospective applications on mine locomotives, mine slushers, post pullers and other underground and surface material handling equipment are now in the design stage.

Undercutter Hard Metal Bit

The Firth Sterling Steel and Carbide Corp. recently announced an undercutter bit, the Firthite C-5. No bit holder is required because bit construction is reported to assure a firm snug fit. The new bit is designed especially for use with Bowdil L-6000 cutter chains.

High Tonnage Classifier

The Deister Concentrator Co. now has in operation a number of Concenco SuperSorters at the preparation plants of some of the largest coal mines. The Concenco SuperSorter is a multiple cell classifier of sufficiently



large capacity to handle large tonnages of material of moderate market value.

The first industrial application, a battery of four 8-cell units, has been in commercial operation for several months classifying the feed for a large battery of coal washing tables. The all-steel cell unit stands 14 ft high. It is 6 ft wide and approximately 5 ft in over-all length. The eight-cell unit has a length of 40 ft and weighs approximately 16 tons.

A feature of the unit is the controlled spigot discharge whereby each classified spigot product may be drawn off intermittently in measured amounts.

Alligator Award

The live alligator exhibited in the Flexible Steel Lacing Co. booth at the Coal Show in Cleveland was awarded to Arthur S. Henry, manager and owner of the Arthur S. Henry Coal Co., Uhlrichsville, Ohio.

Stainless Steel Picture Story

A new technicolor motion picture, "An Orchid to Mr. Jordan," has been released by the United States Steel Corp. It illustrates many of the present-day applications of stainless steel. The 25-minute film centers around a gift of a stainless steel orchid to a design engineer who, by flash-back technique, illustrates the modern uses of stainless steel and explains the reasons for its selection for specific purposes.

"An Orchid to Mr. Jordan" is now available in 16 and 35-mm sound versions through U. S. Steel film distribution centers in Birmingham, Chicago, Cleveland, New York, Pittsburgh, and San Francisco.

— *Announcements* —

Roberts & Schaefer Co., Chicago, has announced the appointment of **E. C. Carris** as assistant to the president of the company, **Frank E. Mueller.** Mr. Carris was formerly preparation manager for Island Creek Coal Co., Holden, W. Va.

Herbert D. Rathbun has been appointed secretary and treasurer of **John A. Roebling's Sons Co.**, Trenton, N. J. He succeeds **Archibald W. Brown,** who has retired after 47 years of service.

The **Atlas Powder Co.**, Wilmington, Del., announced the retirement, under the company's pension plan, of **J. T. Power,** director of the development department; **R. E. Caskey,** special Midwest representative; **A. P. Klenner,** resident manager at Houghton, Mich.; and **W. H. Tuke,** special representative at Pittsburg, Kans.

Henry W. Dodge has joined **Mack Trucks, Inc.**, as executive vice-president with special responsibility for sales and advertising.

Paul A. McDonald has been appointed a district manager of the **Euclid Road Machinery Co.**, succeeding **J. W. Bloomquist** who became assistant sales manager recently. Mr. McDonald will represent Euclid in North and South Dakota, Minnesota, upper Michigan, and parts of Iowa and Wisconsin. The Hibbing office, which serves the Iron Range, remains in charge of **J. R. Blackburn.**

The Baker Industrial Truck Division of the **Baker-Raulang Co.**, Cleveland, has announced the appointment of **John A. Matousek** as manager of manufacturing. **E. H. Remde,** formerly works manager, has been appointed to the newly created post of advisor to the president on engineering and manufacturing; **H. A. Schultz,** formerly superintendent, to manufacturing engineer; and **I. L. Young** to the position of general superintendent.

J. J. Kelleher has been named to the newly created post of assistant sales manager for **Hercules Powder Co.'s** Explosives Department. **L. C. LeBron** has been appointed to succeed Mr. Kelleher as manager of the Contractors Division.

Chester H. Sanderson has been appointed advertising manager of **Mine Safety Appliances Co.**, Pittsburgh, Pa.

P. W. Bigley, sales manager, **Centrifugal and Mechanical Industries, Inc.**, St. Louis, recently announced that **James E. Bilderback** has joined the staff of field representatives. Mr. Bilderback was previously on the operating staff of Moffat Coal Co., Sparta, Ill.

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DIAMOND CORE DRILLING

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Our specialty—Testing bituminous coal lands
Satisfactory cores guaranteed

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TESTING COAL AND ALL MINERAL PROPERTIES - USING OUR LIGHT GASOLINE DRILLS...THEY SAVE FUEL AND MOVING COSTS...WE GUARANTEE SATISFACTORY AND PROPER CORES..

PRE-PRESSURE GROUTING FOR MINE SHAFTS... GROUND SOLIDIFICATION FOR WET MINE AREAS BY OUR STOP GROUT METHOD WATER WELLS AND DISCHARGE HOLES DRILLED AND GROUTED....ELECTRIC DRILLS FOR INSIDE MINE DRILLING

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EXIDE-IRONCLAD BATTERIES ARE DIFFERENT!

Specially designed to provide dependable power for MINE LOCOMOTIVES, SHUTTLE CARS, TRAMMERS

Storage batteries are called upon to perform many tasks. No single type of battery is adequately suited to all. To meet these numerous requirements, Exide engineers have developed special types, to fit each application.* Among these several types is the specially designed Exide-Ironclad Battery. Details shown below.

VENT PLUG specially designed to prevent escape of electrolyte.
GREASE SEAL RING NUT holds battery elements securely in place . . . prevents creepage of electrolyte . . . keeps tops clean and dry.
SEALED CELL COVER flush with top of jar. Prevents collection of dirt or moisture . . . keeps impurities out of cell . . . eliminates leakage of electrolyte.
SEPARATOR of high porosity, specially treated to last the life of the battery.
NEGATIVE PLATE made extra heavy and built to match the long life of the positive plate.
JAR made of specially tough and durable Giant Compound. Built to withstand the jolts and jars of hard industrial usage.
FEET. Internal short circuits practically eliminated because the two feet on negative plate rest on different ribs from those of the positive plate, and because separators extend below both plates and rest on all four ribs.
RIBS support all plates and separators. Their height provides generous sediment space so that internal cleaning is unnecessary.

DIFFERENT IN DESIGN
DIFFERENT IN CONSTRUCTION
DIFFERENT IN SERVICE QUALITIES

Chief among these differences is the unique positive plate, an exclusive Exide feature.

EXIDE-IRONCLAD POSITIVE PLATE
Consists of a series of finely-slotted tubes which contain the active material. So small are these slots that, while permitting easy access of electrolyte, they retard the active material from readily washing out or jarring loose . . . adding considerably to life of plate.

Exide-Ironclad Batteries have ALL FOUR of the characteristics that a storage battery must have to assure maximum performance from mine locomotives, trammers and shuttle cars—high power ability, high electrical efficiency, ruggedness and a long life with minimum maintenance. The combination of these four Exide-Ironclad characteristics assures years of dependable day-in, day-out service.

*

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The Exide-Manchex Battery has the manchester type positive plate with the lead button construction. Specially designed for stationary use in many classes of industry.

DESIGNED FOR AUTOMOBILE USE

The Exide Automobile Battery has plates of staggered grid construction. Specially designed for use in automobiles, trucks, buses, aircraft and numerous other applications.

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the brilliant new

EDISON

MODEL *R-4*

ELECTRIC CAP LAMP

New from headpiece to battery case with:

- ***Positive "Spot"* Adjustment**
- ***Floodlight Beam* when Required**
- ***Comfortably Balanced* Headpiece**
- ***Four-Cell Edison* Nickel-Iron-Alkaline Battery**
- ***Welded Steel* Cell Containers**
- ***Tough Nylon Plastic* Outer Case**

Write for the detailed facts—let us arrange a demonstration for you!

25% More Light

than ever before available in a miner's cap lamp

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